Effigies Authoris.

Arithmetick:

A

TREATISE

Desined for the Use and Benefit of

TRADES-MEN.

Wherein the

Nature and USE of *FRACTIONS*, both *Vulgar* and *Decimal*, are Taught by a New and Easie Method.

ALSO

The Mensuration of SOLIDS and SUPERFICIES.

The Tenth Edition, Corrected and Amended.

By *J. AYRES*, at the *Hand* and *Pen* in St. *Paul*'s Church yard.

London: Printed for *Sam. Crouch*, at the Corner of *Pope's-Head-Alley* next *Cornhill*: And *Tho. Norris* at the *Looking-Glass* on *London Bridge*. 1710.

To the Right Honourable

Sir *William Aſhhurſt*, Kt.

LORD MAYOR

OF THE

City of *LONDON.*

This Manual of

Practical Arithmetick

IS

HUMBLY DEDICATED
AND PRESENTED

BY

Your Lordſhip's
Moſt obliged
Humble Servant,

John Ayres.

THE PREFACE.

THis *Manual of Practical Arithmetick, adapted chiefly for the* Benefit *and* Use *of* Tradesmen, *is the Product of some vacant Hours. A* Work *for its Nature and Kind* differing *from any thing heretofore published that I know of: All the* Rules *being made* plain *and* easie *to the* meanest *Capacities, for whose sakes it is principally intended : which is the Reason so much of the Book is taken up in* Explaining *and Teaching the* Ground-work, viz. *Addition, Subtraction, Multiplication, and Division, which most Arithmetick Books are deficient in; a Defect in any of those Rules will render the Labours of such as learn Arithmetick by Books very difficult and hard. To help which, I have first of all laid down the* plainest way of Division *for a Learner that wants the help of Master, and afterwards have given the* shortest Italian way of Division. *I have also omitted several Rules that are not of Use in Trade, such as* Alligation Barter, Loss and Gain, Company with Time, &c. *And have supplied those Omissions with what is more Useful and Practical,* viz. *Great Enlargements, and Variety of the Golden Rule of Three, The Rule of Three Inverse, Double Rule of Three, and the Use of the Compound Rule of Five* Numbers *in working Interest, and the Nature of Exchange, Rules of Practice, with great Variety, and* short ways *to cast up* Merchandize. *The Order of Deducting* Tare and Tret, *with other Rules useful in Trade. Lastly, I have made* Fractions *very easie and familiar (though differing from any former Method) having mixed both* Vulgar *and* Decimal Fractions *together under the same Head, that the Ingenious may discover the Ease as well as Excellency and Brevity of the* Decimal *beyond the* Vulgar Fraction. *And as my Paper would admit, have added some Variety of Measuring Superficies and Solids.*

The Faults in former Impressions, care has been taken to correct in this Tenth Edition.

Arithmetick.

CHAP. I.
Of NUMERATION.

I. ARITHMETICK is the Art of Numbring well, or of Accompting well by Numbers; For as Magnitude or Greatneſs is the Subject of *Geometry*, ſo is Multitude or Number the Subject of *Arithmetick*.

II. The whole Art of *Arithmetick* depends upon the true Knowledge of the Five following Rules, viz. *Numeration*, *Addition*, *Subtraction*, *Multiplication*, and *Diviſion*. All the other Rules being compounded of theſe, we ſhall treat particularly of Them in their order.

III. *NUMERATION Teacheth to expreſs or write down the value of any Number whatſoever propoſed.*

IV. All Numbers are written with ten Characters called Figures, of which the laſt is called a Cypher, and of it ſelf ſignifieth nothing, but ſerveth (according as it is placed) to increaſe or diminiſh the value of another Figure to which it is either annexed or prefixed.

V. The *Ten* Characters or *Figures* by which all Numbers are expreſſed, are thus *written*, viz. 1 one; 2, two; 3, three; 4, four; 5, five; 6, ſix; 7, ſeven; 8, eight; 9, nine; 0, Cypher; The Nine firſt of theſe are called ſignificant Figures.

VI. All Numbers are either *Simple* or *Compound.*

1. A Number is ſaid to be *Simple*, when it conſiſteth but of *one Figure*, as 4, 8, and 6, *&c.* are ſimple or ſingle Numbers.

2. A Number is ſaid to be a *Compound* Number when it is compoſed of *two, three, four* or *more Figures*; ſuch as are 35, 356, 7428, *&c.*

VII. Every *ſignificant Figure* hath a double Value, *viz. Certain* or *Uncertain.*

1. The *value* of a Figure may be ſaid to be *certain*, when it ſignifieth *ſimply* its *own* proper *value*, without the Addition of any other word for its explanation, and ſo 4 ſignifieth *four*, 8 ſignifieth *eight*, and 9 is *nine*, &c.

2. The *value* of a figure may be ſaid to be *uncertain*, in reſpect of the *place* it may ſtand in, and ſo 4 may ſignifie *forty*, or *four hundred*, or *four thouſand*, &c. and 8 may ſignifie *eighty*, or *eight hundred*, or *eight thouſand*, &c.

VIII. When a *Number* is compoſed of divers *Figures* ſet together like the Letters in a word, that *Number* is ſaid to *conſiſt* of as many places as there are *Figures* uſed in the compoſing thereof. So the Number 4643 is ſaid to *conſiſt* of *four* places, becauſe it is compoſed of *four* Figures; the like is to be underſtood of any other.

IX. The *places* in *every Compound* Number are to be conſidered both as to their *order*, and their *value*.

1. The *Order* of the *place* is from the *right hand* to the left, the *firſt Figure* or Cypher towards the *right hand* is ſaid to poſſeſs the firſt place, and the next towards the *left hand*, is ſaid to poſſeſs the ſecond place, and the next to that the third place, *&c.*

S

So if this Number were propoſed, *viz.* 5734, here 4 is ſaid to poſſeſs the firſt, 3 the ſecond, 7 the third, and 5 the fourth place, *&c.*

2. The *value* of every Figure is *diſcovered* by the place that it ſtands in; *viz.* The *firſt* place is the place of *Unites*, or ones; and the Figure that ſtandeth in that place ſignifieth its *own* proper or *ſimple* value. The *ſecond* place is the place of *Tens*, and the figure that ſtandeth there ſignifieth as many *Tens* as the Figure it ſelf containeth *Unites*: As if it be 4, it ſignifies four *tens*, or forty; if it be 7, it ſignifieth ſeven *tens*, or ſeventy, *&c.* The *third* place is the place of *Hundreds*, and the *Figure* that ſtandeth there, is as many *hundreds* as it containeth *Unites*: So 5 in the third place is five hundred, and 6 ſignifieth ſix hundred, *&c.* The *fourth* place is the place of *Thouſands*, and the Figure that ſtandeth therein ſignifieth as many *thouſands* as it contains *Unites*; ſo 8 in the fourth place is eight thouſand, and 4 is four thouſand, *&c.* As,

Suppoſe this Number, *viz.* 4652, were given to have its *value* expreſſed; The figure 2 (in the firſt place) is two *unites*, or ſimply *two*; the figure 5 (in the ſecond place) is five *tens* or fifty; ſo 52 is thus expreſſed, *viz. fifty two*: The figure 6 (in the third place) is ſix hundred, ſo 652 is thus expreſſed, *viz ſix hundred fifty two*; the figure 4 (in the fourth place) is *four thouſand*, ſo 4652 is thus to be read, *viz. Four thouſand ſix hundred fifty two.*

In like manner if any figure hath a *Cypher*, or *Cyphers* annexed to it, it ſhall ſtill retain the *value* of its place, as much as if a ſignificant figure, or figures, were annexed to it in the room of the *Cypher* or *Cyphers*; ſo if the figure 6, there

be a *Cypher* annexed thus (60) its value is *six tens* or *sixty*, because it standeth in the second place, or place of *Tens*. Likewise if it have two *Cyphers* annexed to it thus (600,) its value is *six hundred* because it possesseth the third place, or place of *Hundreds*. Also 6000 is *six thousand*, because 6 standeth in the fourth place, or place of *Thousands*.

And the value of any Figure increaseth in a *Decuple* proportion from the *right* hand to the *left*, every place being *ten times* the value of the former, as you may see in the following Table.

Numeration Table.

Hundreds of Millions	*Tens of Millions*	*Millions*	*Hundreds of Thousands*	*Tens of Thousands*	*Thousands*	*Hundreds*	*Tens*	*Unites*	*The Numbers in the Table are thus to be Read, viz.*
9	8	7	6	5	4	3	2	1	987 Mil. 654 Th. 321
1	2	3	4	5	6	7	8	9	123 Mil. 456 Th. 789
	2	3	4	5	6	7	8	9	--23 Mil. 456 Th. 789
		3	4	5	6	7	8	9	—3 Mil. 456 Th. 789
			4	5	6	7	8	9	———— 456 Th. 789
				5	6	7	8	9	———— —56 Th. 789
					6	7	8	9	———— 6 Th. 789
						7	8	9	———— 789
							8	9	———— 89
								9	———— 9

Q

Over againſt every place of the Numbers in the foregoing Table is written (in words at length) the value thereof; *viz. Unites, Tens, Hundreds, Thouſands,* &c. which words being perfectly gotten by heart, and well underſtood, the Learner will be thereby enabled to expreſs or write down the value of any Number propoſed.

And on the right hand of the Table, over againſt every Number therein contained, you have direction how to read or expreſs thoſe Numbers; As 987654321 is thus to be read, *viz. Nine hundred eighty ſeven Millions, ſix hundred fifty four Thouſand three hundred twenty one.* And the like is to be underſtood of the reſt.

Note, Although the foregoing Table be made to conſiſt but of Nine places, yet it may be continued to more places at pleaſure, even *ad infinitum*, obſerving that the value of every place is ten times as much as that which goeth before it; ſo the tenth place is *Thouſands of Millions*, the eleventh place is *Tens of Thouſands of Millions*, the twelfth place is *Hundreds of Thouſands of Millions*, and the thirteenth place is *Millions of Millions*, &c.

There is yet another Method uſed by ſome, that is very plain and uſeful in the expreſſing of great Numbers, or Numbers conſiſting of many places, which is this, *viz.* make a point after every third Figure, beginning at the right hand, as in the following Example.

Let this Number be propoſed conſiſting of fourteen places, *viz.* 84639042724536, and when every third figure is pointed it will be thus, *viz.* 84. 639. 042. 724. 536. every three figures being called a period, and are reckoned in order from the right hand towards the left, *viz.* 536 is the firſt Period, 724 is the ſecond Period, 042 the third,

third, *&c.* the firſt Period (which is 536) conſiſteth of *Units*, *Tens*, and *Hundreds*, and is thus expreſſed, *viz.* *Five Hundred Thirty ſix*, and every other Period is to be read in every reſpect as if it ſtood in the place of the firſt Period, only in expreſſing the value of the ſecond Period, you muſt add thereto the word *Thouſand*; to the third Period you muſt add the word *Millions*; to the fourth Period the word *Thouſands*; to the fifth Period *Millions of Millions*; and ſo the Number before propoſed is to be read as followeth, *viz.*

Millions of Millions	*Thouſand*	*Millions*	*Thouſands*	
84.	639.	042.	724.	536.

Eighty four *Millions of Millions*, ſix hundred thirty nine *Thouſand*, forty two *Millions*, ſeven hundred twenty four *Thouſand*, five *hundred* thirty ſix.

CHAP. II.

Of ADDITION.

1. ADDITION *Teacheth to add, or put together divers Numbers, and to bring them to one total Sum.* As if ſeven and nine were given to be added

added together their Sum will be 16; and the Sum of 5 and 4 is 9.

II. *Numbers* to be added together, each of them *consist* either of *one* Denomination, or of *divers*, as if it were required to add 16 *l.* to 14 *l.* here both the given *numbers* are of *one* Denomination, being *Pounds* only, without Shillings, Pence or Farthings: But if it were required to add 36 *l.* 14 *s.* 08 *d.* to 16 *l.* 12 *s.* 06 *d.* these consists of *divers* Denominations, *viz.* of Pounds Shillings and Pence.

III. When it is required to *add* together several *Numbers* of one *Denomination*, they must (in order to the work) be disposed of according to the following *Rule*, viz.

Place *the given Numbers one under the other in such order, that Units may stand under Units, Tens under Tens, Hundreds under Hundreds, Thousands under Thousands*, &c.

If you were to add 136 and 42 together, they must be placed one under the other as followeth, *viz.*

136 42	Or,	42 136

IV. Having placed the given Numbers as before is directed, then draw a streight line under them, and (beginning at the place of *Units*) add all the Figures together that stand over one another in that *Rank*; putting their Sum under the said streight Line; as in this Example. I say, 2 and 6 is 8, wherefore I put 8 under the Line, and in its proper place, *viz.* under 2 and 6 and proceed to the next Rank, which is the place of Tens, saying, 4 and 3 is 7, whereof I put 7 in

tis

its proper place under the line; and proceed to the next and last rank, where I find only 1, wherefore I put one in its proper place under the line, and so the work is finished, and I find thereby that the Total Sum of 136 and 42 to be 178; See the Operation as followeth.

136	42
42	136
178	178

V. If in adding together any of the Ranks (as i[llegible] before directed) their Sum amounts to, or exceed[s] eth 10, or any number of tens, then in such cas[e] you are either to set down a *Cypher* under the lin[e] in its proper place, or else the *excess* above the *te[n]* or tens; and for every *ten* carry an *unit* to be adde[d] to the next *Rank* of Figures. As if it amount t[o] 30, then set down (0) a Cypher, and carry (for the three tens) to be added to the next *Rank* if it amount to 34, then set down 4 under th[e] *Rank* that you *added*, and carry three to the nex[t] *&c.* And when you have cast up the last *Rank* towards the Left Hand, set down the Tot[al] *Series* that it amounteth to, as in the following E[x]amples.

	(1)	(2)	(3)	(4)
	748	4758	1648	20864
	364	6473	3472	78987
	296	2894	1865	6217
	242	1862	3479	4320
Sum	1650	15987	10464	110388

In the firſt of theſe Examples I begin, ſaying, 2 and 6 is 8, and 4 is 12, and 8 makes 20, which is juſt two tens; wherefore I put down 0 under the line and carry two to the next Rank for the 2 Tens, and proceed, ſaying, 2 that I carry and 4 is 6, and 9 is 15, and 6 is 21, and 4 is 25, which is 5 above twenty, wherefore I put down 5 under the line, and carry two for the two tens to the next Rank, and then proceed ſaying, 2 that I carry and 2 is 4, and 2 is 6, and 3 is 9, and 7 makes 16, wherefore (becauſe it is the laſt rank) I put down 16 under the line, and ſo the work is finiſhed, the total Sum of the Addition being 1650: The ſame is to be obſerved in the reſt of the Examples.

VI. Addition *of divers Denominations* cannot be well performed, until you know the value of common Coins, Weights, and Meaſures, *&c.* As how many Pence make 1 Shilling, how many Shillings make 1 Pound, and how many Ounces make 1 Pound, how many Pound make a Quarter of a C. and how many Quarters make a C. weight.

In Addition of Engliſh Money, it is neceſſary firſt of all to underſtand the meaning and ſignification of the Characters ſuperſcribed over every Sum, as *li. s. d.*

Note, That *li* ſignifies, Libra, a *Pound*, not here in reſpect of common Weight, but *Money*, and for diſtinction is called a *Pound Sterling*. So *s.* ſtands for Solidus (a Coin of Braſs) uſed by the *Romans*, but with us of Silver, and ſignifies a *Shilling*, twenty of theſe pieces make *one Pound Sterling*.

de. or *d.* ſtands for Denarius, a *Penny*, which contained ten Pieces of the *Romans* leaſt Coin: It hath had a various Eſtimate in our *Engliſh Coins*. It now ſignifies a Peny, the 12 part of a Shilling, or 12 of which make a Shilling. For until the

the Reign of *Henry* VI. a Penny was the 20th part of an Ounce of Silver, and in his Reign made the 30th. By *Edw.* IV. 40 Pence made an Ounce. By *Henry* VIII. there was allowed 45*d.* to the Ounce. And by Q. *Elizabeth* an Ounce of Silver was divided into 60 parts, called Pence, as it is at this day.

ADDITION of MONEY.

Note, 4 *Farthings is a Penny*, 12 *Pence a Shilling*, *and* 20 *Shillings a Pound* Sterling, *or* English *Money*.

The following Tables ought to be learned by heart.

				d.		s.		d.
12 times	1	is	12	20	is	1	:	8
	2		24	30		2	:	6
	3		36	40		3	:	4
	4		48	50		4	:	2
	5		60	60		5	:	0
	6		72	70		5	:	10
	7		84	80		6	:	8
	8		96	90		7	:	6
	9		108	100		8	:	4
	10		120	110		9	:	2
	11		132	120		10	:	0
	12		144					

VII. When it is required to *add* together *Numbers* consisting of *divers Denominations*, you are to place the given Numbers in such order one under the other, that each Rank may consist of one and the same Denomination. That is to say, if it be in Mony: Let *Pounds* be set under *Pounds*, *Shillings* under *Shillings*, *Pence* under *Pence*, and *Farthings* under *Farthings*. The like is to be understood of *Weight*, *Measure*, *Time*, &c.

The

Then (having firſt drawn a Line under them) add them together, conſidering how many of each ſmaller Denomination make at Unite of the next that is ſuperior to it, (always obſerving to begin at the leaſt Denomination,) and for every ſuch Unite, carry one to the next ſuperior Denomination, *viz.* If it be in Addition of Money, for every 4 in the Farthings you muſt carry 1 to the Pence (becauſe 4 Farthings is a Penny); For every 12 in the Pence carry 1 to the Shillings (becauſe 12 Pence is a Shilling); and for every 20 contained in the Shillings, carry 1 to the Pounds (becauſe 20 Shillings is a Pound); And the odd Farthings, Pence and Shillings, ſet down in their proper Ranks under the Line, as in the following Example.

Some do indeed make a place of *Farthings*, and ſet a *q.* over them for *quartillier*, which is not very proper, and ſeldom uſed by Men of Buſineſs; therefore when you would write down three Farthings, or a Half penny, or a Farthing, write it thus:

$\frac{3}{4}$ ——— *Three Farthings.*
$\frac{1}{2}$ ——— *A Half-penny.*
$\frac{1}{4}$ ——— *A Farthing.*

Let it be required to add together 134 *l.* 16 *s.* 08 *d.* $\frac{1}{4}$ and 286 *l.* 10 *s.* 04 *d.* $\frac{3}{4}$ and 498 *l.* 13 *s.* 06 *d.* $\frac{1}{2}$ and 794 *l.* 18 *s.* 09 *d.* $\frac{1}{4}$. Then in order to the work I ſet them down and draw a Line under them, as followeth.

℔.		s.		d.
134	:	16	:	08 $\frac{1}{4}$
286	:	10	:	04 $\frac{3}{4}$
498	:	13	:	06 $\frac{1}{2}$
794	:	18	:	09 $\frac{1}{4}$

Firſt,

First, I begin with the least Denomination which is that of Farthings, and add them together, saying $\frac{1}{4}$ and $\frac{1}{2}$ is $\frac{3}{4}$, and $\frac{3}{4}$ is 6, and $\frac{1}{4}$ is 7 Farthings, which is 1 Penny and 3 Farthings, wherefore I put 3 Farthings under the Line, and under the Denomination of Farthings, and carry 1 (for the Peny) to the next Denomination of Pence, saying, 1 that I carry and 9 is 10, and 6 is 16, and 4 is 20, and 8 is 28, now 28 Pence is 2 Shillings 4 Pence, wherefore I put 4 under the Line, and carry 2 Shillings to the Denomination of Shillings, saying, 2 that I carry and 18 is 20, and 13 is 33, and 10 is 43, and 16 is 59 Shillings, which is 2 Pounds 19 Shillings, whereof I put the 19 Shillings under the Line, and under the Denomination of Shillings, and carry 2 (for the 2 Pounds) to the Denomination of Pounds, and proceed, saying, 2 that I carry and 4 is 6, and 8 is 14, and 6 is 20, and 4 makes 24, wherefore I put down 4 under the Line, and carry 2 for the two tens to the next Rank, saying, 2 that I carry and 9 is 11, and 9 is 20, and 8 is 28, and 3 is 31, which is 1 above 30, wherefore I put 1 under the Line and carry 3 (for the three tens) to the next Rank, and proceed saying, 3 that I carry and 7 is 10, and 4 is 14, and 2 is 16, and 1 is 17, wherefore I put 17 under the Line, because it is the Sum of the last Rank, and so the whole work is finished, and I find the Sum of the given Numbers to be 1714*l.* 19*s.* 4d. 03*q.* as by the following work appeareth.

l.		*s.*		*d.*
134	:	16	:	08 $\frac{1}{4}$
286	:	10	:	04 $\frac{3}{4}$
498	:	13	:	06 $\frac{1}{2}$
794	:	18	:	09 $\frac{1}{4}$
Sum 1714	:	19	:	04 $\frac{3}{4}$

To prove your Addition after you have added up your whole Sum, draw a Line with your Pen under the uppermoſt Number, or Sum, and then add together all the other Numbers, except the *uppermoſt.* And when you have ſo done, add the Amount, or Sum thereof to the uppermoſt Sum above the Line. And if that Sum be equal to the Sum firſt found, the Work is true, otherwiſe not.

Here, *Note once for all*, that whatſoever Sums you are to add together, whether of *Money*, *Weight*, *Meaſure*, *Time*, *&c.* That when you come to the greateſt Denomination, as you caſt up the ſeveral Ranks thereof, you are to carry the Tens of every preceding Rank to that which follows it, as is directed in the Fifth Section of this Chapter, and as the Ranks in the Denomination of Pounds in the laſt Example are caſt up.

The Old common way of Addition of Money, is to make a *ſpeck* or Tittle with your *Pen* at every 12 that is found in the *Addition* of your *Pence*, and ſo many ſpecks as you find carry ſo many *Shillings* to the Place of *Shillings*, ſetting down what remains above 12 under the place of Pence. Then make a ſpeck at every 20 you find in the *Addition* of your *Shillings*, and for ſo many *ſpecks* carry ſo many *Pounds* to the place of *Pounds*, ſetting down the *overplus* under the place of *Shillings*, and then proceed to add up the *Pounds*. But

But the best Method, which I would commend to your Practice is this:

First, Cast up your Pence, or make a small Comma at every 60 *d.* which is 5 *s.* (and it will be a great ease to the Memory where Sums are long) and by the foregoing Table you may readily know, how many shillings and Pence your Pence amount to; then set down your odd Pence under the place of Pence, and carry your Shillings to the Unit of Shillings, and add them up as in Addition of Numbers, by setting down the odd above the Tens, and carry the Tens to the Tens of Shillings, or Angels (because 10 *s.* is an Angel) then for every two in place of Angels carry so many Pounds to the place of Pounds. An Example or two will make it plain and easier.

Example I.

A Shop keeper looking over his Shop-book, finds that A owes him 195 l. 11 s. 9 d. $\frac{1}{2}$ *B* 57 l. 14 s. 10 d. $\frac{1}{4}$ *C* 450 l. 10 s. 2 d. *D* 27 l. 16 *s.* 11 d. $\frac{3}{4}$ *E* 44 l. 13 s. 9 d. $\frac{1}{2}$ *F* 100 l. *G.* 8 l. 14 s. 9 d. $\frac{1}{2}$ *H* 160 l. 10 s. 2 d. $\frac{1}{2}$ *I* 54 l. 11 s. 11 d. *K* 73 l. 9 s. 10 d. $\frac{1}{4}$.

In order to the work, place the Sums one under the other, as is before directed, thus.

l. A——

	l.		*s.*		*d.*
——— *A*	195	:	11	:	9 $\frac{1}{2}$
——— *B*	57	:	14	:	10 $\frac{1}{4}$
——— *C*	450	:	10	:	2
——— *D*	27	:	16	:	11 $\frac{3}{4}$
——— *E*	44	:	13	:	9 $\frac{1}{2}$
——— *F*	100	:	00	:	0
——— *G*	8	:	14	:	9 $\frac{1}{2}$
——— *H*	160	:	10	:	2 $\frac{1}{2}$
——— *I*	54	:	11	:	11
——— *K*	73	:	9	:	10 $\frac{1}{4}$
Sum	1173	:	14	:	4 $\frac{1}{4}$

Then begin with the leaſt Denomination towards the right hand, which is Farthings, ſaying, 1 and 2 is 3, and 2 is 5, and 2 is 7, and 3 is 10, and 1 is a 11, and 2 is 13 Farthings, which is 3 Pence $\frac{1}{4}$, wherefore put down $\frac{1}{4}$ under the Farthings, and carry 3 Pence to the place of Pence, and ſay, 3 and 10 is 13, and 11 is 24, and 2 is 26, and 9 is 35, and 9 is 44, and 11 is 55, and 2 is 57, and 10 is 67, and 9 is 76. Now by your Table 72 Pence is 6 *s.* therefore 76 is 6 *s.* 4*d.* wherefore put down 4 *d.* under the place of Pence, and carry 6 *s.* to the place of Shillings, ſaying, 6 that you carry and 9 is 15, and 1 is 16, and 4 is 20, and 3 is 23, and 6 is 29, and 4 is 33, and 1 is 34, wherefore put down 4 under the place of Shillings, and carry *three Tens* to the place of *Tens of Shillings*, or *Angels*, and ſay, 3 that you carry and 1 is 4, and 1 is 5, and 1 is 6, and 1 is 7, and 1 is 8, and 1 is 9, and 1 is 10, and 1 is 11; now 11 Angels, or 11 ten Shillings is 5 *l.* 10 *s.* or 5 *l.* 1 Angel,

gel, therefore place 1 Angel under the Angels, and it makes the 4 to be 14 *s.* which place under the place of Shillings, and carry 5 Pound to the place of Pounds, and finish the Work as before directed; and the Total Sum found will appear to be 1173 *l.* 14 *s.* 4 *d.* $\frac{1}{4}$.

Example II.

A Banker on the Ballance of his Books, finds himself indebted to L. 50 l. 10 s. 3 d. $\frac{1}{4}$ *to M.* 100 l. 10 s. 10 d. *to N.* 25 l. 7 s. 8 d. $\frac{3}{4}$ *to O.* 59 l. 17 s. *to P.* 507 l. 16 s. 10 d. $\frac{1}{2}$ *to Q* 7 l. 14 s. 9 d. $\frac{1}{4}$ *to R.* 37 s. *to S.* 25 s. 11 d. $\frac{1}{2}$ *to T.* 415 l. 10 s. 9 d. *to V.* 76 l. 13 s. 9 d. $\frac{1}{2}$ *to W.* 100 l. *to X.* 15 s. 11 d. $\frac{1}{2}$ *to Y.* 17 l. 17 s. *to Z.* 10 l. 00 s. 4 d. $\frac{1}{2}$.

	l.		*s.*		*d.*
L ———	50	:	10	:	3 $\frac{1}{4}$
M ———	100	:	10	:	10
N ———	25	:	7	:	8 $\frac{3}{4}$
O ———	59	:	17	:	0
P ———	507	:	16	:	10 $\frac{1}{2}$
Q ———	7	:	14	:	9 $\frac{1}{4}$
R ———	1	:	17	:	0
S ———	1	:	5	:	11 $\frac{1}{2}$
T ———	415	:	10	:	9
V ———	76	:	13	:	9 $\frac{1}{2}$
W ———	100	:	00	:	0
X ———	00	:	15	:	11 $\frac{1}{2}$
Y ———	17	:	17	:	0
Z ———	10	:	00	:	4 $\frac{1}{2}$
Sum	1375	:	18	:	3 $\frac{3}{4}$

Fi

First of all add up your Farthings, as before directed, and they make 15, which is 3 *d.* $\frac{3}{4}$ place $\frac{3}{4}$ under the Farthings, and carry 3 Pence to the Pence, and ſay, 3 and 4 is 7, and 11 is 18, and 9 is 27, and 9 is 36, and 11 is 47, and 9 is 56, and 10 is 66, *at which* 10 *make a Comma, becauſe 66 d. is* 5 *s.* 6 *d.* then proceed and carry 6 *d.* to the next Figure, which is 8, and ſay, 6 and 8 is 14, and 10 is 24, and 3 is 27. Now 27 *d.* is 2 *s.* 3 *d.* and the 5 *s.* before makes 7 *s.* 3 *d.* wherefore ſet down the 3 Pence under the place of Pence, and carry 7 Shillings, to the place of Shillings, and proceed to finiſh your Sum as was taught you in the laſt precedent, and the Total Sum will appear to be 1375 *l.* 18 *s.* 3 *d.* $\frac{3}{4}$.

Addition of Averdupois *Weight.*

Note, *That* 16 *Drams is an Ounce,* 16 *Ounces is a Pound,* 28 *Pound is a Quarter of an Hundred,* 4 *Quarters is an Hundred weight, conſiſting of* 112 *Pounds, and* 20 *Hundred is a Tun Averdupois weight.*

The Marks or Characters by which this weight is known or expreſſed are theſe, *viz. For Tuns (T.) Hundreds (C.) Quarters (Qr.) Pounds* (lb.) *Ounces (oz.) Drams (dr.)* As in the following Examples.

Tun

Tun.	*C.*	*qr.*	℔.	*C.*	*qr.*	℔.	*oz.*
25 :	14 :	2 :	24.	154 :	1 :	19 :	10
57 :	16 :	3 :	25.	275 :	3 :	19 :	11
42 :	10 :	1 :	17	476 :	2 :	10 :	07
96 :	14 :	2 :	27.	57 :	3 :	14 :	08
54 :	17 :	2 :	18.	45 :	1 :	10 :	10
59 :	16 :	3 :	22.	17 :	2 :	22 :	11
75 :	14 :	2 :	19.	45 :	3 :	17 :	09
64 :	17 :	3 :	26	76 :	2 :	19 :	14
478 :	04 :	0 :	10	1150 :	2 :	01 :	00

Let it be required to add up the Sum above, expressing *Tun. C. qr.* and ℔. First, add up the Pounds by making a Speck or Tittle at every 28 you find in the place of Pounds, as you may see in the above-mentioned Example, where is found to be six specks and 10 ℔ over, which 10 place under the Denomination of Pounds, and carry 6 to the Quarters, and add them up, they make 24, which is 6 *C.* for which put a (o) under the place of *qrs* and carry 6 *C.* to the place of C. Then proceed to add up your *C.* after the same manner as you carry from Shillings to Pounds, because 20 *C.* make a *Tun.* Lastly, add up the *Tuns*, and the Total will appear to be 478 *Tun.* 04 *C.* o *qr.* 10 ℔.

With *Troy Weight* are weighed Bread, Gold, Silver, and Electuaries. And with *Averdupois Weight* are weighed Butter, Cheese, Flesh, Wax, Tallow, Pitch, Rozen, Lead, Iron, all sorts of Grocery Wares, and all such kind of garble whence there may issue a waste.

The Pound *Averdupois*, containing 16 Ounces, is equal to 14 *oz.* 12 *pw.* *Troy Weight.* And 112 Pound

Pound *Troy Weight*, confiſting of 12 Ounces, is about 13 Ounces 2 Drams and a half of *Averdupois Weight*; ſo that he who tells you a Pound of Bread is as heavy as a Pound of Cheeſe is very much miſtaken, the one being a Pound *Troy*, and the other a Pound *Averdupois Weight*.

WOOL is alſo weighed with *Averdupois Weight*, but the Diviſions are ſomewhat different, *viz.* for Wool.

7 *Pound is a Clove*, 2 *Cloves is a Stone*, 2 *Stone is a Tod*, 6 *Toods* 1 *Stone*, 12 *Stone is a Wey*, 2 *Weys is a Sack*, *and* 12 *Sacks is a Laſt of Wool.*

Note, That according to the foregoing Diviſion, 182 ℔. is a *Wey*, but in ſome Countries the *Wey* is 256 ℔. *Averdupois*, as in *Suffolk*, &c. And in *Eſſex* there is 336 ℔. in a *Wey*.

Addition of Apothecaries *Weights.*

Apothecaries Weights are the ſame in the main with *Troy Weight*, only the Subdiviſions of the Pound are different, as followeth, *viz.*

Note, *That* 20 *Grains is a Scruple*, 3 *Scruples is a Dram*, 8 *Drams is an Ounce*, *and* 12 *Ounces is a Pound Weight. The* Marks or Characters by which Apothecaries Weights are known are theſe, *viz. or Pounds* (℔). *Ounces* (℥.) *Drams* (ʒ.) *Scruples* (℈) *and Grains* (*gr.*)

℔.	℥.	ʒ.	℈.	gr.
76	09	2	0	15
54	10	5	2	17
68	11	7	1	13
28	04	4	1	12
16	10	0	2	18
35	06	1	0	14
281	04	6	1	09

Addition of Troy *Weight.*

Note, *That 24 Grains is a Penny-weight,* 20 *Penny-weights is an Ounce, and* 12 *Ounces is a Pound Troy weight.*

The Notes or Characters by which *Troy weight* is known are these, *viz.* The Mark of Pounds is (℔.) of Ounces (*oz.*) of Penny-weights (*pw.*) of Grains (*gr.*)

Let it be required to add the following particulars together, *viz.* 24 ℔. 09 *oz.* 06 *pw.* 11 *gr.* and 164 ℔. 10 *oz.* 14 *pw.* 18 *gr.* and 82 ℔. 7 *oz.* 17 *pw.* 20 *gr.* and 8 ℔. 11 *oz.* 18 *pw.* 22 *gr.*

Now

Now, in order to find out the Sum of these given Quantities, I place them one under the other orderly, as you see in the Margent, and draw a Line under them. Then I begin with the Denomination of Grains, making a prick with the Pen at every 24 (for ease) and bear the overplus to the next above, saying, 22 and 20 is 42 which is 18 above 24, wherefore I make a Mark at 20, and

℔	*oz.*	*pw.*	*gr.*
24	09	06	11
164	10	14	18.
82	07	17	20.
8	11	18	22
281	03	17	23

carry the 18 up higher, saying, 18 and 18 is 36, which is 12 above 24. wherefore I make a Mark at 18, and carry the 12 to the next above saying, 12 and 11 make 23. which I put under the Line in its proper place, and observe how many Pricks I have made in the casting up this Denomination, which I find to be 2, wherefore I carry 2 to the next, and proceed (as in the Shillings in *Addition* of *Money*, because I carry one for every 20) saying, and 8 is 10, and 7 is 17, and 4 is 21, and 6 is 7, and (then down again with the Tens) 10 is 7, and 10 is 47, and 10 is 57 Penny-weights, which is 2 *oz.* 17 *pw.* wherefore I put 17 *pw.* in s place under the Line, and carry the 2 *oz.* saying, 2 that I carry and 1 is 3, and 7 is 10, and 9 19, and 10 is 29, and 10 is 39 Ounces, which 3 ℔. 3 *oz.* wherefore I put the 3 Ounces in its proper place under the Line, and carry the 3 ℔. the Pounds, and proceed to finish the Work as fore is directed, which being done, I find the tal Sum to be 281 ℔. 3 *oz.* 17 *pw.* 23 *gr.* as in e Margent.

More Examples for Practice follow.

lb.	oz.	pw.	gr.
379	05	14	18.
168	11	17	14
794	09	10	22.
634	10	18	20.
75	06	11	15.
34	00	06	16
2087	09	09	09

lb.	oz.	pw.	gr.
297	10	07	13
768	09	14	06
635	11	18	21.
74	08	18	19
35	10	14	14
24	06	16	18
1837	10	10	19

Addition of Liquid *Measure.*

The least Denomination in Liquid Measure is Pint, which was heretofore deduced from a Poun Troy Weight, a Pound of Wheat Troy Weight ma ing a Pint Liquid Measure, but in regard of the Dif greement thereof with the Rules of Solid Geomet in the gauging of Brewers Vessels, some taking 2 solid Inches for a Gallon, some 286, &c. it occa oned a difference between the Brewers and the M nagers of His Majesties Excise, till the Parliame taking the Matter into Consideration, ordained th 282 solid Inches should make the Gallon of B Measure, and the Gallon being subdivided int Pottles, each Pottle into 2 Quarts, and each Q into 2 Pints, so that the Pint being the Eig part of a Gallon, must contain 28 solid In and 7 eighth parts of an Inch for Wine Meas and 35 solid Inches and a quarter for Beer Meas *Wherefore Note, that* 35 $\frac{1}{4}$ *solid Inches make a* P *Beer Measure,* 2 *Pints is a Quart, and* 2 *Qu*

is a Pottle, 2 Pootles or 282 solid Inches a Gallon, 8 Gallons is a Firkin of Ale, 9 Gallons is a Firkin of Beer, and 2 Firkins is a Kilderkin, and 2 Kilderkins is a Barrel, 1 ½ Barrel, or 54 Gallons is a Hogshead of Beer.

In Wine *Measure.*

2 Pints is a Quart, 2 Quarts is a Pottle, 2 Pottles is a Gallon, 42 Gallons is a Tearce, or Third part of a Pipe or Butt, 63 Gallons is a Hogshead, 2 Hogsheads is a Pipe or Butt, and 2 Pipes or Butts is a Tun of Wine.

☞ Note, Honey and Oyl are meaſured by this Meaſure.

Examples of Wine *Measure.*

T.	*hhds.*	*gal.*	*pts.*	*T.*	*hhds.*	*gal.*	*pts.*
37	3	18	5	240	1	48	3
48	2	24	0	196	3	22	1
67	1	20	6	97	3	51	5
38	2	17	7	85	2	17	6
79	0	47	3	43	0	25	0
64	1	52	4	93	1	38	5
335	3	55	1	757	1	14	4

Addition of Dry *Measure.*

The leaſt Denominative part of dry Meaſure is a Pint, which is taken from *Troy Weight.*

With theſe are meaſured all dry Subſtances, as *Corn, Salt, Coal, Sand,* &c. The Table followeth.

In Dry Measure, Note that 2 *Pints make a Quart*, 2 *Quarts a Pottle*, 2 *Pottles a Gallon*, 2 *Gallons a Peck*, 4 *Pecks a Bushel Land Measure*, 5 *Pecks a Bushel Water Measure*, 8 *Bushels a Quarter*, 4 *Quarters a Chalder*, *and* 5 *Quarters a Wey*.

Note, 36 *Bushels is a Chaldron of Sea-Coal in* London.

Examples of Dry *Measure.*

Chald.	qurs.	bush.	pec.	Chald.	qurs.	bush.	pec.
148	3	6	3	227	1	5	0
375	1	7	2	742	3	7	1
296	2	4	3	148	2	4	1
128	1	5	0	97	2	6	3
94	0	5	2	48	0	3	0
38	2	4	3	62	3	1	1
1082	1	2	1	1327	2	3	2

Addition of Long *Measure.*

Long Measure is originally deduced from a Barley-Corn taken out of the middle of the Ear and well dried, from whence is deduced the following Table, *viz.*

In Long Measure, Note, that 3 *Barley-Corns make an Inch*, 12 *Inches a Foot*, 3 *Foot a Yard*, 3 *Foot* 9 *Inches, or a Yard and a Quarter, is an Ell English*, 6 *Feet a Fathom*, 5 *Yards and an half, or* 16 *Feet and an half, make one Statute Pole, or Pearch*, 40 *Poles or Perches make a Furlong, and* 8 *Furlongs make an English Mile.*

Examples

Examples of Long *Measure.*

Miles	*Fur.*	*Perch.*	*Miles*	*Fur.*	*Perch.*
48	7	24	134	3	18
37	3	18	342	4	24
65	5	28	179	5	16
36	5	00	84	0	25
107	1	07	76	7	27
205	6	17	84	2	13
501	6	04	902	1	03

Addition of Cloth *Measure.*

Note, That 4 *Nails, or* 9 *Inches make a quarter of a Yard,* 3 *quarters of a Yard make an Ell* Flemish, 4 *quarters a Yard* English, 5 *quarters of a Yard, or* 25 *Inches is an Ell* English.

Examples of Cloth *Measure.*

yds.	*qrs.*	*na.*	*Ells*	*qrs.*	*na.*	*Ell. fl.*	*qrs.*	*na.*
137	3	3	376	2	0	184	1	2
295	1	2	178	3	3	357	2	1
112	2	3	742	3	1	475	2	2
215	0	1	97	2	2	251	1	0
174	1	2	84	1	2	164	0	2
764	3	0	68	0	3	87	1	3
1700	0	3	1547	3	3	1521	0	2

Addition of Land *Measure.*

From the foregoing Table of Long Meaſure, is alſo ſuperficial Meaſure deduced, that of Land Meaſure being as followeth, *viz.*

In Land Meaſure, 40 ſquare Poles or Perches make a Rood, and 4 Roods make an Acre.

Examples of Land *Meaſure.*

Acr.	*Rood.*	*Per.*	*Arc.*	*Rood.*	*Per.*	*Acr.*	*Rood.*	*Per.*
120	2	34	164	1	20	320	3	10
275	3	14	130	3	25	180	1	19
162	1	35	644	2	17	672	3	28
98	2	20	563	0	24	191	0	12
47	3	30	372	3	18	634	1	15
64	1	15	140	1	26	87	2	14
769	3	28	2016	1	10	2087	0	18

Of Time.

The Denominative parts of Time are originally deduced from the Sun's Motion in the Heavens, which is carried round the ſame from *Eaſt* to *Weſt* by the Rapid Motion of the *Primum Mobile* in one Day Natural, which Day is divided into 24 ſuppoſed equal parts, called Hours, and each Hour is ſubdivided into 60 Minutes, &c. whence ariſeth the following Table, *viz.*

In *Time*, Note, That 60 *Minutes make an Hour*, 24 *Hours make a Natural Day*, 7 *Days make a Week*, 4 *Weeks make a Month, conſiſting of* 28 *Days*, 13 *Months* 1 *Day and* 6 *Hours make a Year.*

However,

However in the ordinary Computation of Time, the Year is divided into 12 unequal Calendar Months, whose Names and the Numbers of Days that each containeth, are as followeth, *viz.*

	Days.		Days.
January	31	*July*	31
February	28	*August*	31
March	31	*September*	30
April	30	*October*	31
May	31	*November*	30
June	30	*December*	31

Note, That the 6 odd Hours is reckoned but once in 4 Years, and the one whole day is added to that Year, making it to consist of 366 days, and is called *Leap-Year*; the said day is added to *February*, which then containeth 29 days.

Note also, *That the Minute is usually subdivided into 60 Seconds, and each Second into 60 Thirds*, &c.

The Tropical Year, or the time the Sun leaves the Tropick, till the time it returns to it again; by the Observation of the most Accurate Astronomers, is found to consist of 365 *Days*, 5 *Hours*, 49 *Minutes*, 4 *Seconds*, and 21 *Thirds*.

CHAP. III.

Of SUBTRACTION.

I. SUBTRACTION *Teacheth to take a lesser Number from a greater, or an equal from an equal; whereby we discover the* Remainder Excess, or Difference.

II. *In Subtraction*, if the Numbers given be integers, that is, consisting of one Denomination, then place the biggest Number uppermost, and the lesser in order under it, *viz.* Units under Units, Tens under Tens, Hundreds under Hundreds, *&c.* And draw a Line under them.

III. Then begin at the place of Units, taking the lowermost Figure out of the uppermost, and place the Remainder under the Line, then proceed to the place of Tens, and do in the same manner, and then to the place of Hundreds, *&c.* till the whole Work be finished: Then shall the Number under the said Line be the Remainder or Difference.

Example.

Let it be required to find the difference between 48 *and* 16?

First, I put down the biggest Number, 48, and place 16 the lesser Number under it, and under both I draw a Line, as you see in the Margent; then I begin at the place of Units, saying, 6 out of 8 and there remains 2, which I place under the Line, and proceed to the next place, saying, 1 from 4 and there remains 3, which I likewise place under the Line, and the Work is finished. So that I find the remainder or difference between 48 and 16 to be 32, as you may see by the Work in the Margent.

$$\begin{array}{r} 48 \\ 16 \\ \hline 32 \end{array}$$

More Examples of the like nature follow.

From	743	586	3785	1842
Subtr.	121	270	205	342
Remains	622	316	3580	1500

But if the particular Figure which you are to *Subtract*, be greater than the Figure out of which it is to be *Subtracted*; then you are to borrow 10, and add it to the uppermoſt Figure, and then *Subtract* the ſaid lowermoſt Figure, from their Sum, and place the *Remainder* underneath the Line, and for that which you borrowed, add 1 to the next Figure in the lowermoſt Line, and proceed. Let this be repeated as often as there is occaſion.

Example.

Let it be required to Subtract 3872 *from* 43758.

The given Numbers being placed, and a Line drawn under them, as is before directed, I begin at the right Hand, ſaying 2 from 8, and there remains 6, which I ſet under the Line, and proceed, ſaying, 7 from 5 I cannot, but 7 from 15, and there remains 8, which I put under the Line, and proceed to the next, ſaying, 1 that I borrow'd and 8 is 9 from 7 I cannot, but 9 from 17 and there remains 8, which I put under the Line, and proceed to the next Figure, ſaying, 1 that I borrowed and 3 is 4, from 3 I cannot, but 4 from 13 and there remains 9, which I put under the Line; now becauſe there is no Figure

43758
3872
39886

ſtand-

ſtanding under the 4, I therefore ſuppoſe a (o) Cypher to be placed there, and becauſe I borrowed 1 at the laſt Figure, therefore I pay it here by Subtracting it out of the 4, ſaying, 1 that I borrowed out of 4 and there remains 3, which I put under the Line, and the Work is finiſhed; and I find (after the Work of Subtraction is ended) the remainder to be 39886. Theſe Examples being well underſtood, will render what follows to be plain and eaſie.

From	7458	50876	10008576
Subtr.	467	947	8743
Remains	6991	49929	9999833
From	5100	30210	15764
Take	1754	10325	7276
Reſt	3346	19885	8488
Proof	5100	30210	15764

The Proof of Subtraction.

For Proof of Subtraction, add the Reſt, or Remainder, to the Number Subtracted, and if the Sum be equal to the uppermoſt Number (*being the Number from whence Subtraction is made*) your Work is true, otherwiſe falſe, as you may ſee in the laſt Example of Subtraction above mentioned.

Subtraction of Money.

IV. If the given Numbers consist of divers Denominations, such as *Money*, *Weight*, *Measure*, *Time*, &c. Then you are to place the lesser Number under the greater, in such sort that each Denomination may stand under its correspondent Name, as has been directed in *Addition*, and draw a Line under them.

Then proceed to Subtract the undermost from the uppermost, beginning at the least denomination, and proceeding gradually towards the left hand, setting the *Remainder* of each Denomination under the Line until the whole be finished: As for Example.

Let it be required to Subtract 126 *l.* 07 *s.* 04 *d.* $\frac{1}{4}$. from 254 *l.* 13 *s.* 10 *d.* $\frac{3}{4}$. First I place them down the lesser under the greater, and draw a Line under them, as you see in the Margent.

Then I begin at the right hand saying, 1 Farthing from 3 Farthings and there remains 2, which I put under the Line in the place of Farthings, and proceed to the Denomination of Pence, saying, 4 from 10 and there remains 6, which I put under the Line in the place of Pence, and then I go to the Denomination of Shillings, saying, 7 from 13 and there rests 6, which I put under the Line in the place of Shillings, and then I proceed to finish the Work according to the third Rule of this Chapter; which being ended, I find the Remainder to be 128 *l.* 06 *s.* 06 *d.* $\frac{1}{2}$. as you see in the Margent.

l.	*s.*	*d.*
254 :	13 :	10 $\frac{3}{4}$
126 :	07 :	04 $\frac{1}{4}$
128 :	06 :	06 $\frac{1}{2}$

V. But

V. But if the lowermoſt Number in any of the Denominations chance to be greater than the uppermoſt, you muſt in ſuch caſe borrow an Unit from the next greater Denomination, Subtracting the lowermoſt Number therefrom, and *adding the Remainder* to the ſaid uppermoſt Number, and place that Sum under the Line; and then proceed, adding one to the next lowermoſt Number to the left hand for that you borrowed, *&c.*

A few Examples will make this Rule very plain.

l.	*s.*	*d.*
348 :	12 :	07 $\frac{3}{4}$
178 :	15 :	09 $\frac{1}{4}$
196 :	16 :	10 $\frac{1}{2}$

Let it be required to ſubtract 178 *l.* 15 *s.* 9 *d.* $\frac{1}{4}$ from 348 *l.* 12 *s.* 7 *d.* $\frac{3}{4}$. Firſt, I place them down in order, as has been before directed, and draw a Line under them. Then I begin at the right hand with the Denomination of Farthings, ſaying, 1 from 3 and there remains 2, which I put under the Line, and proceed to the Denomination of Pence, ſaying, 9 Pence out of 7 Pence I cannot, but (borrowing one from the next Denomination, which is Shillings, and makes 12 Pence, I ſay) 9 from 12 and there remains 3, which I add to the 7 Pence and that makes 10 Pence, wherefore I put 10 Pence under the Line, and proceed to the next Denomination, which is Shillings, and ſay, 1 that I borrowed and 15 is 16 from 12 I cannot, but (borrowing 1 Pound from the next Denomination, which is 20 Shillings) 16 from 20 and there remains 4, which added to the ſaid 12 makes 16 Shillings, which I ſet down under the Line, and proceed to the Pounds, ſaying, 1 that I borrowed and 8 is 9 from 8 I cannot, but 9 from 18, *&c.* And the Work being finiſhed, I find the Remainder to be 169 *l.* 16 *s.* 10 *d.* $\frac{1}{2}$. as appears by the Work in the Margent.

Examples

Examples for Practice.

	l.	s.	d.	l.	s.	d.
Received	295	11	03 ¼	415	00	05 ½
Paid	107	14	09 ½	107	11	08 ¾
Rest	187	16	06 ¼	307	08	08 ¾
Proof	295	11	03 ¼	415	00	05 ½
Debtor	100	00	00	1072	01	05
Creditor	75	00	00	107	16	10 ½
Ballance	24	19	03	964	04	06 ½
Proof	100	00	00	1072	01	05
Received	1010	10	10	100	00	09 ½
Disburst	942	13	11 ½	47	00	00
Rest	67	16	10 ½	52	19	11 ½
Proof	1010	10	10	100	00	09 ½

VI. If a Sum be lent, and Payment thereof made at ſeveral times in part, and you would know how much remains due, in this caſe you muſt add the ſeveral Payments into one Sum, and Subtract that Sum from the Sum lent, and the Remainder will ſhew how much is due. An Example or two will make it plain and eaſie.

Lent

	l.	s.	d.	l.	s.	d.
Lent	3475	10	05	572	11	05
Paid at several times	358	14	07 $\frac{1}{2}$	154	09	07 $\frac{1}{4}$
	514	07	11 $\frac{3}{4}$	95	10	07
	294	16	09	6	14	05 $\frac{1}{2}$
	344	10	08 $\frac{1}{2}$	72	11	04
	365	15	10 $\frac{1}{4}$	16	17	02
	795	15	07 $\frac{1}{4}$	9	14	11 $\frac{1}{2}$
	462	14	08	164	17	09
Paid in all	3136	16	02 $\frac{1}{4}$	520	15	10 $\frac{1}{4}$
Rest due	338	14	02 $\frac{3}{4}$	51	15	06 $\frac{3}{4}$
Proof	3475	10	05	572	11	05

Examples.

	l.	s.	d.
Lent	4768	17	10 $\frac{1}{4}$
Received at several times	347	14	06 $\frac{1}{2}$
	785	11	11 $\frac{3}{4}$
	128	15	09 $\frac{1}{4}$
	420	16	05
	124	00	02 $\frac{3}{4}$
Received in all	1806	18	11 $\frac{1}{4}$
Remains due	2961	18	11

Bor-

	l.	s.	d.	l.	s.	d.
Borrowed	3475 :	10 :	05	4620 :	00 :	00
Paid at several times	358 :	14 :	07 $\frac{1}{2}$	409 :	09 :	10
	514 :	07 :	11 $\frac{3}{4}$	276 :	15 :	07 $\frac{3}{4}$
	294 :	16 :	09	195 :	13 :	11 $\frac{3}{4}$
	344 :	10 :	08 $\frac{1}{2}$	167 :	19 :	10 $\frac{1}{2}$
	365 :	15 :	10 $\frac{1}{4}$	984 :	16 :	05 $\frac{1}{4}$
	792 :	05 :	06 $\frac{1}{2}$	785 :	07 :	06
Paid in all	2670 :	11 :	05 $\frac{1}{2}$	2820 :	03 :	02 $\frac{3}{4}$
Rests due	804 :	18 :	11 $\frac{1}{2}$	1799 :	16 :	09 $\frac{3}{4}$
Proof	3475 :	10 :	05	6420 :	00 :	00

Let us prove the Example of the Fifth Rule in Subtraction of Money, where it is required to Subtract 178 *l.* 15 *s.* 9 *d.* $\frac{1}{4}$. from 348 *l.* 12 *s.* 7 *d.* $\frac{3}{4}$.

	l.	s.	d.
From	348 :	12 :	07 $\frac{3}{4}$
Subtr.	178 :	15 :	09 $\frac{1}{4}$
Remain	169 :	16 :	10 $\frac{1}{2}$
Proof	348 :	12 :	07 $\frac{3}{4}$

In this Example the Remainder is found to be 169 *l.* 16 *s.* 10 *d.* $\frac{1}{2}$. which I add to 178 *l.* 15 *s.* 9 *l.* $\frac{1}{4}$ (the Number given to be subtracted) and the Sum is 348 *l.* 12 *s.* 7 *d.* $\frac{3}{4}$. which is

is equal to the uppermost of the given Numbers, wherefore I conclude the Subtraction to be truly wrought.

Subtraction of Averdupois *Weight.*

A *Salter* buys 45 Tun, 7 C. 1 qr. 12 lb. of *Logwood, of which he* sold 19 Tun, 14 C. 1 qr. 18 lb.

In order to the Work, I dispose of the given Numbers according to the Directions of the Fourth Rule of this Chapter, drawing a Line under them, as you see in the Example.

Tun.		*C.*		*qr.*		*lb.*
45	:	07	:	1	:	12
19	:	14	:	1	:	18
25	:	12	:	3	:	22

Then I begin at the right hand, which is pound weights, saying, 18 out of 12 I cannot, but 18 of 28 (borrowing a qr. of a C. (*which is* 28 lb.) and there remains 10, to which add the 12 lb. it makes 22 lb. which I place under the lb. and carry one to the quarters, and say, 1 that I borrowed and 1 is 2, now 2 quarters out of 1 I cannot, but 2 out of 4 quarters (*which is a C. weight*) there remains 2, to which add the 1 quarter, it makes 3, which I place under the qrs. and proceed to the C. and say, 1 that I borrowed and 14 C. is 15 C. now 15 C. out of 7 C. I cannot, but 15 C. out of 20 C. (*which is a Tun*) there remains 5, to which add the 7 C. it makes 12 C. which I place under the C. and pro-

proceed to the Tuns, and ſay, 1 that I carried and 9 is 10, 10 out of 5 I cannot, but 10 out of 15, reſt 5, and carry 1, and ſay, 1 that I carry and 1 is 2, out of 4 and there remains 2, and the Work is finiſhed, and I find the *Remainder* or *Difference* to be 25 *Tun*, 12 *C.* 3 *qrs.* 22 lb.

More Examples for the Learners Practice.

	Tun.	*C.*	*qr.*	lb.	*C.*	*qr.*	lb.
Bought	107 :	10 :	2 :	05	74 :	0 :	15
Sold	94 :	17 :	3 :	10	19 :	1 :	11
Reſt	12 :	12 :	2 :	23	54 :	3 :	04
Proof	107 :	10 :	2 :	05	74 :	0 :	15

	C.	*qrs.*	lb.	*C.*	*qrs.*	lb.
Bought	194 :	3 :	27	454 :	1 :	17
Sold	99 :	2 :	16	196 :	3 :	22
Unſold	95 :	1 :	11	257 :	1 :	23
Proof	194 :	3 :	27	454 :	1 :	17

If ſeveral Quantities in *Groſs Weight* be given, one of which you would Subtract the *Tare*, in ſuch a caſe add the Groſs Weight into one Total: And

And add the Tare likewise into one Total. Then Subtract the Total of the *Tare* from the Total of the *Groß*, the Remainder is *Neat* weight.

Example.

A Merchant sells 6 Hogsheads of Sugar, viz.

	C.	qrs.	lb.
N° 1 Gr.	14 :	2 :	10
2 ——	17 :	1 :	19
3 ——	16 :	2 :	14
4 ——	17 :	1 :	10
5 ——	18 :	2 :	17
6 ——	14 :	1 :	22
Groſs	99 :	0 :	08
Tare	12 :	3 :	24
Reſt Neat.	86 :	0 :	12

	C.	qrs.	lb.
Tare	1 :	3 :	15
	2 :	0 :	05
	2 :	1 :	10
	2 :	1 :	16
	2 :	1 :	12
	1 :	3 :	22
Tare	12 :	3 :	24

Subtraction of Troy *Weight.*

	oz.	pw.	gr.	oz.	pw.	gr.
Bought	115 :	07 :	05	976 :	11 :	06
Sold	94 :	13 :	10	149 :	14 :	11
Reſt	20 :	13 :	19	826 :	16 :	19
Proof	115 :	07 :	05	976 :	11 :	06

Bough[t]

	lb.	oz.	pw.	lb.	oz.	pw.	gr.
Bought	375	05	13 $\frac{1}{2}$	194	3	09	16
Sold	196	10	17 $\frac{1}{4}$	95	7	14	18
Rest	178	06	16 $\frac{1}{4}$	98	7	14	22
Proof	375	05	13 $\frac{1}{2}$	194	3	09	16

I might proceed to give Examples in Subtraction of Liquid Meaſure, Dry Meaſure, Long Meaſure, Apothecaries Weights, Time, Motion, *&c.* but there being no more difference between the Working of theſe and thoſe Examples, than only obſerving the Tables of each, which are delivered in the ſecond Chapter, therefore I forbear, this being ſufficient for the meaneſt Capacity.

CHAP. IV.

Of MULTIPLICATION.

I. IN *Multiplication* there are always two Numbers given to find out a third, which ſhall contain either of the given Numbers as many times as the other containeth an Unit.

II. Of the two Numbers given, the one is called the *Multiplicand*, and the other is called the *Multiplier*, and the Number found out by the Operation is called the *Product.*

III. The

III. The *Multiplicand* is the Number given to be Multiplied, and is uſually for orders ſake, the biggeſt of the two given Numbers.

IV. The *Multiplier* is that by which the *Multiplicand* is Multiplied, and is uſually the leaſt Number.

V. The *Product* is the Number produced by the Multiplication, and it containeth the *Multiplier* as many times as the *Multiplicand* containeth Units; or it containeth the *Multiplicand* as often as the *Multiplier* containeth Units.

VI. *Multiplication* is either Simple or Compound.

VII. *Simple Multiplication* is when the Multiplicand and the Multiplier, do each of them conſiſt of one ſingle Figure only: As if it were required to multiply 4 by 3, 5 by 2, 9 by 7, &c. Here 3 times 4 is 12, and 2 times 5 is 10, and 7 times 9 is 63; now 12, 10, and 63, are the *Products* of each Multiplication.

VIII. All the variety of *Simple Multiplication* is contained in the following Table, which muſt be learned by heart, before the Learner can make any further Progreſs.

Multipli-

Multiplication TABLE.

2 times	2 is	4
	3	6
	4	8
	5	10
	6	12
	7	14
	8	16
	9	18
	10	20
	11	22
	12	24
3 times	3 is	9
	4	12
	5	15
	6	18
	7	21
	8	24
	9	27
	10	30
	11	33
	12	36
4 times	4 is	16
	5	20
	6	24
	7	28
	8	32
	9	36
	10	40
	11	44
	12	48
5 times	5 is	25
	6	30
	7	35
	8	40
	9	45
	10	50
	11	55
	12	60
6 times	6 is	36
	7	42
	8	48
	9	54
	10	60
	11	66
	12	72
7 times	7 is	49
	8	56
	9	63
	10	70
	11	77
	12	84
8 times	8 is	64
	9	72
	10	80
	11	88
	12	96
9 times	9 is	81
	10	90
	11	99
	12	108

IX. *Compound Multiplication* is when the *Multiplicand*, or *Multiplier*, or both of them, do confiſt of *Compound Numbers*, that is, of more Figures or Places than one.

As if it were required to Multiply 324 by 2, here the *Multiplicand* is 324, which confiſteth of 3 places, and the *Multiplier* is 2.

X. When it is required to Multiply one Number by another, firſt ſet down the biggeſt Number for the Multiplicand, and under that the *Multiplier* in ſuch order as has been taught in Addition and Subtraction, *viz.* Units under Units, Tens under Tens, &c. and draw a Line under them.

As if it were required to Multiply 324 by 2, I ſet them down as followeth, *viz.*

The Multiplicand	324
The Multiplier	2

Then I begin with the place of Units, ſaying, 2 times 4 is 8, which I put under the Line; then 2 times 2 is 4, which I alſo put under the Line; and 2 times 3 is 6, which I alſo put under the Line; and the Work is finiſhed: So that I find 324 being Multiplied by 2, produceth 648, as by the following Work.

The Multiplicand	324
The Multiplier	2
The Product	648

XI. When the Product of any ſingle Figure amounts to 10, or a certain number of Tens, then you are to ſet down a Cypher, and carry an Un[it]
fi[...]

for every Ten to the Product of the next Figure; or if it comes to above 10, or any number of Tens, then ſet down the exceſs, and carry an unit for every Ten, *&c.* as in the following Example.

Let it be required to Multiply 785641 by 5.

The Number being ſet down according to the Tenth Rule, I begin, ſaying, 5 times 1 is 5, which I put under the Line, and proceed, ſaying, 5 times 4 is 20, wherefore I put down 0, and carry 2 for the 2 Tens to the next, ſaying, 5 times 6 is 30, and 2 that I carried is 32, wherefore I put down 2 and carry 3 from the 3 Tens to the next Figure, ſaying, 5 times 5 is 25, and 3 that I carried is 28, wherefore I put down 8, and carry 2 to the next, ſaying, 5 times 8 is 40, and 2 that I carried is 42, ſo I put down 2, and carry 4 to the next Figure, ſaying, 5 times 7 is 35, and 4 that I carry is 39, which being the laſt Figure, I put down 39 under the Line, and ſo the Work is finiſhed, and I find that 785641 being Multiplied by 5 the Product is 3928205, as appears by the whole Work in the Margent.

785641
5
3928205

And here by the way, Note, *That Multiplication is a Compendious Performance of Addition*, for in the laſt Example, if inſtead of Multiplying 785641 by 5, I put down the Multiplyand 5 times in order one under the other, and add them all together, then will the Sum of them amount to the Product that was found by the foregoing Work of Multiplication, as appears by the Work in the Margent. The ſame may be performed by any other Example.

785641
785641
785641
785641
785641
3928205

Other Examples for this Rule for Practice may be such as follow.

748046	570084	7115083
4	6	8
2992184	3420504	56920664
72190	35726	145796
9	5	10
649710	178630	1457960

XII. When the *Multiplier* consists of divers places, then must there be as many *particular Products* as there are places therein, and for the true placing of each Product, observe to put the first Figure or place of Units under its proper *Multiplier*, and when you have done, draw a Line under the whole Work, and add the *several Products* together, and their Sum will be the total Product required.

Example I.

Let it be required to Multiply 46753 *by* 46.

Having placed the given Numbers in order to the Work, according to the Tenth Rule of this Chapter, and drawn a line under them, as you see in the Margent, I begin to Multiply with the 6, saying, 6 times 3 is 18, wherefore I put down 8 under the Line, and carry 1 to the next, saying, 6 times 5 is 30, and 1 that I carry is 31, &c. so that the Product by 6 is 280518. Then I begin with the 4, saying

46753
46
280518
187012
2150638

aying, 4 times 3 is 12, wherefore I put down 2 under the Line, and under the Figure 4 by which Multiply) and carry 1 for the Ten to the next, aying 4 times 5 is 20, and 1 that I carry is 21, vherefore I set down 1, and carry 2 to the next, &c. and I find the single Product by 4 to be 87012, and so the Multiplication is ended: Then draw a Line under these two particular Products, nd add them together in the order as they stand, nd the Sum is 2150638, which is the true Product of 46753 being Multiplied by 46, that is, 46 imes 46753, is 2050638, and is equal to the Sum f 46753, being set 46 times one under another nd added together. Behold the whole Work of Multiplication in the Margent.

Example II.

Let it be required to Multiply 5800846 *by* 478.

First, I dispose of the given Numbers in order to he Operation, according to the tenth Rule foregoing.

Then I begin and Multiply the whole *Multiplicand* by (the first Figure of the *Multiplier*) 8, and he Product thereof is 46406768; then I Multiply he same again by (the second Figure of the Multiplier) 7, and the Product thereof is 0605922, the first Figure whereof, *viz.* 2, I place under the 7, by hich I Multiply. Then I proceed Multiply by 4, and the Product ence arising is 23203384; the first igure whereof, which is 4 I place nder 4, by which I Multiply, and all e rest in their order, and so the whole

```
   5800846
       478
  --------
  46406768
 40605922
23203384
----------
2772804388
```

whole Work of Multiplication is finiſhed: Then I draw a Line under all, and add up the ſeveral Products, and their Sum is 2772804388, which is the total Product.

A General Rule in Multiplication, is chiefly to obſerve, That in whatſoever place the Figure of the Multiplier (whether a Cypher or Cyphers) ſtands from the place of Units, in the ſame place muſt the firſt Figure of that Multiplication be ſet from the Unit of the Multiplicand.

And ſince the greateſt Difficulty in Multiplication ariſes from having a Cypher or Cyphers in the Multipliers, I ſhall endeavour to make it plain and eaſier by the following Examples.

Example I.

Where there is one or more Cyphers in the Multiplier betwixt ſignificant Figures.

(2)	(1)
45793	8465008
507	4006
320551	50790048
2289650	33860032000
23217051	33910822048

In the firſt Example you ſee that the Cyphers are put at the ſame diſtance from the Unit of the Multiplicand that they ſtand in from the Unit of the Multiplier; as 4, the Fourth Figure of the Multiplier (the firſt Figure in that Multiplication which is 2) is ſet in the Fourth place from the Unit of the Multiplicand.

Exampl

Example II.

Where the Multiplier hath one or more Cyphers to the right hand thereof.

(1)	(2)
546735	7645932
4620	48000
10934700	61167456
3280410	30583728
2186940	367004736000
2525915700	

Or, *You may Multiply by the significant* Figures, neglecting the Cyphers *(as in the second Sum) as if here were none, only to the Product annex as many Cyphers as there were Cyphers in the Multiplier.*

Example III.

Where the *Multiplicand* and *Multiplier* have each of them Cyphers at the right hand

(1)	(2)
58400	438700
760	67000
3504000	30709
408800	26322
44384000	29392900000

Or, *You may* neglect the Cyphers *(as in the second um) only to the Product annex as many Cyphers as here were Cyphers to the right hand of the Multiplicand nd Multiplier.*

XIII. When the *Multiplier* consists of a Unit i[n] the highest place toward the left hand, and all th[e] rest Cyphers towards the right hand, as 10, 10[0,] 1000, &c. then is the whole Work performed [by] annexing the Cypher of the Multiplier to the F[i-]gures of the Multiplicand; as in the following E[x-]amples.

6507	6507	6507
1000	100	10
6507000	650700	65070

XIV. *It is necessary for all such as would be dextro[us] and ready at Arithmetick, to learn to Multiply* [*by*] *these Compound Numbers following very readily,* [*in*] *one Operation,* viz.

Ex. Mult.		574967	Mult.		8425[9]
by		11	by		
	fa.	6324637		*fa.*	101154[...]
		345786			8594[...]
		110			11[...]
Product		38036460		*fa.*	1031312[...]
		7504675			32172[...]
		12			
		90056100			38607[...]

Here 574967 is Multiplied by 11 thus, [11] times 7 is 77, put down 7, and carry 7, [and] then 11 times 6 is 66, and 7 I carry is 73, [put] do[wn]

down 3, and carry 7, then 11 times 9 is 99, and 7 I carry is 106, put down 6, and carry 10, then 11 times 4 is 44, and 10 I carry is 54, put down 4, and carry 5, then 11 times 7 is 77, and 5 is 82, put down 2 and carry 8, then 11 times 5 is 55, and 8 I carry is 63, which put down, so the Product of 574967 multiplied by 11 is found to be 6324637.

In like manner to multiply 842958 by 12, say, 12 times 8 is 96, put down 6, and carry 9, then 12 times 5 is 60, and 9 I carry is 69, put down 9 and carry 6, and so proceed till you have gone through your Sum.

To multiply any Number by 110, or 120, put down a Cypher, and Multiply as before.

Multiply	423760	Multiply		543760
by	1200	by		1200
Product	466136000		*fa.*	652512000

The Proof of Multiplication.

XV. When you would prove the Truth of your Work in Multiplication, first, with your Pen make a Crofs, and then add the Figures of the Multiplicand together, not confidering their value as to the places they poffefs, but as if they were all Units, cafting away the Nines as often as may be, and put the laft Remainder on the left fide of the Crofs made for that purpofe, then likewife add the Figures in the *Multiplier* together, cafting away the Nines as often as may be, and put the laft Remainder on the right fide of the Crofs; then multiply thefe two Remainders one by another,

ther, and caſt away all the Nines out of their Product, and put their remainder above the Croſs; then add together the Figures of the Product, caſting away the Nines as often as may be, and put the laſt Remainder under the Croſs, and then look if the Figure above the Croſs, and the Figure below the Croſs be equal, then is your Sum rightly performed, otherwiſe nor.

As for Example: Let it be required to multiply 587464 by 465; when the Work is finiſhed, I find the Product to be 273170760, as by the Following Work appears.

6	587464
7 + 6	465
6	
	2937320
	3524784
	2349856
	273170760

Now to prove whether the Work be rightly perform'd, I firſt make a Croſs as you ſee above, and then begin to add the Figures of the *Multiplicand* together, ſaying, 5 and 8 is 13, caſt away 9 and there reſts 4; then 4 and 7 is 11, caſt away 9 and there reſts 2; then 2 and 4 is 6, and 6 is 12, caſt away 9 and there remains 3; then 3 and 4 is 7, which I put down on the left ſide of the Croſs: Then I add together the Figures of the *Multiplier*, as I did thoſe of the *Multiplicand*, and the laſt Remainder there is 6, which I put on the right ſide of the Croſs; then do I multiply theſe two Figures together which ſtand on each ſide of the Croſs, *viz.* 6 and 7, and their Product is

42,

42, out of which I caſt the Nines as often as may be, and there remains 6, which I put on the top of the Croſs. But the eaſieſt way to caſt the Nines out of any Number, is to add the Figures together which conſtitute that Number, and their Sum is the Remainder when the Nines are caſt away as often as may be, ſo in this Example, the Nines are eaſily caſt out of 42 (which is the Product of 6 by 7) for 42 is conſtituted of 4 and 2, whoſe Sum is 6; but if the ſaid Sum chance to come to more than 9, caſt 9 out of it, and put down the Remainder, ſo 8 times 7 is 56, the Sum of which Figures (5 and 6) is 11, out of which taking 9 there reſt 2, which is the true Remainder when the Nines are caſt out of 56 as often ~~as may~~ be.

Now in this Example, having put the ſaid Remainder 6 above the Croſs, I proceed to caſt away the Nine out of the Product, and there remains 6 likewiſe, which I put below the Croſs, and becauſe the Figure above and below the Croſs are equal, *viz.* each 6, I conclude the Work to be truly performed.

But the true *Proof of Multiplication* is by Diviſion, as ſhall be taught in that Rule, this way by caſting away the Nines many times proving the Work to be true, when it is abſolutely falſe, but when it proveth not true this way, the Sum cannot be right.

CHAP. V.

Of DIVISION.

DIVISION *Teacheth to Divide any given Number into as many equal parts as you please.* Or,

It is that by which we discover how often one Number is contained in another.

II. In Division there are always 3 Numbers *certain*, and a fourth *accidental*.

III. Of the 3 Numbers certain two are always given to find out a Third, *viz.* The one of the Numbers given is to be *Divided*, the other Number given is that by which the first is *Divided*, and the Number found out is the *Quotient*, and discovers how often the one Number is contained in the other.

IV. Therefore in this Rule are three remarkable Numbers, *viz.* The *Dividend*, the *Divisor*, and the *Quotient*.

(1.) The *Dividend* is the Number given to be divided into equal parts.

(2.) The *Divisor* is the Number given by which the *Dividend* is to be divided, which declareth into how many equal parts the *Dividend* is to be divided.

(3.) The *Quotient* is the Number *Invented* by the Operation, and shews *how often* the *Divisor* is contained in the *Dividend*.

And the *Remainder* is the Number which remains after the *Division* is ended, which is uncertain, and is the Fourth accidental Number, I mentioned before.

As ſuppoſe 15 were given to be divided by 3, or 15 Shillings to be divided amongſt 3 Men, here 15 is the *Dividend*, 3 is the *Diviſor*, and 5 is the *Quotient*, for 3 is contained in 15 juſt 5 times, without any Remainder; but if you were to divide 20 by 3, the *Quotient* would be 6, and the *Remainder* 2, for 3 is contained in 20, 6 times, and 2 remains over.

In *Diviſion* (*by one Figure*) you are firſt to write down the *Dividend*, and then draw a crooked Line, and place the *Diviſor* on the left hand thereof, then draw a Line under the *Dividend*, under which place your *Quotient*.

Example.

Let it be required to Divide 45 by 9, here the *Quotient* is 5, becauſe 9 is contained in 45, 5 times, and theſe ought to be placed as followeth.

	Dividend.
Diviſor 9)	45
Quotient	5

V. When a Number is given to be divided by a *ſingle* Figure or *Digit*, if the firſt Figure of the *Dividend*, viz. (*that on the left hand*) be bigger, or at leaſt equal to the *Diviſor*, you are to put a Point or Prick under the ſame, and then proceed as followeth.

Example.

Suppoſe it were required to divide 6788 by 4, the given Numbers are placed as before directed.

making a Prick under (6) the first Figure of the *Dividend*, which for distinction sake may be called the *Dividual*, as followeth.

	Dividend
Divisor 4)	6788
Quotient	1697

Note, In every *Division* you are to observe this Method; first, to *Seek*, secondly, to *Multiply*, thirdly, to *Subtract*.

As in the last Example, after you have writ down your *Dividend* and *Divisor*, as was shewed you, first, seek how often (or how many times) 4, which is the *Divisor*, can you have in 6, which is the first Figure of the *Dividend* towards the left hand, the Answer is once, which I place in the *Quotient* exactly under the 6 (as you see in the Operation of the Sum) and say, once four out of 6, there will remain 2, which 2 is two Tens to the next Figure 7, and makes the new *Dividual* 27. Then ask again (*or seek*) how often 4, the *Divisor*, can you have in 27, *Answer* 6 times, which 6 place in the *Quotient* under 7, the second Figure of the *Dividend*, then take 6 times 4 which is 24 out of 27, there will remain 3, which is three Tens to 8, the third Figure of the Dividend, and makes it 38. Then *ask* again, how many times 4 can you have in 38? Answer, 9 times; which 9 place in the Quotient under 8, the third Figure of the Dividend; then take 4 times 9, which is 36, out of 38, there will remain 2, which is two Tens to the Fourth and last Figure of the Dividend, and makes the 8 to be 28. Then *Lastly*, seek how often the Divisor 4 can you have

in

28; Anſwer, 7 times, which I place under 8 he laſt Figure of the Dividend, and your Work is one; the Quotient being found to be 1697, hich is the Number of times the Diviſor 4 is ound in the Dividend 6788. Or if the ſaid Sum ere to be divided between 4 Men, each Man's hare would be 1697 Pounds.

But to make this plain to any ordinary Capacity, ſhall take the Dividend into pieces, to ſhew the our ſeveral Operations of the laſt Sum, and then ive you ſome Examples for your Practice therein.

	Dividend						
Diviſor 4)	6788						
		4)	6	27	38	28	
Quotient	1697						
			1	6	9	7	

If you take 1 time 4 out of 6, there will remain 2 to the ſecond Figure 7, which makes it 27; hen 4 in 27, there will be 6 times, and 3 will remain to the third Figure 8, which makes it 38; hen 4 in 38, there will be 9 times, and 2 will remain to the fourth Figure, which is 8, and makes t 28; then 4 in 28, is 7 times, which place under 8, the laſt of your *Dividend*, and your Quotient will be 1697.

Examples for the Learners Practice.

(1)	(2)	(3)
5) 712640	6) 721494	7) 42165
142528	120249	6023$\frac{4}{7}$

VI.

VI. *If you cannot take the Divisor out of the Di-dend*, as in the ſecond Example, then are you to put a Cypher in the Quotient, and reckon that Figure as ſo many Tens to the next, as before I ſhewed you in the laſt Rule.

Example.

$$6)\ \underline{721494}$$
$$120249$$

Say, 6 in 7 once, reſt 1, which makes the 2 12; then 6 in 12, 2 times; then 6 1, 0 times, reſt 1, which makes the 4, 14; then 6 in 14, 2 times, reſt 2, which makes the 9, 29; then 6 in 29, 4 times, reſt 5, which makes the 4, 54; then 6 in 54, 9 times, ſo the Quotient is 120249.

VII. *If after you have divided, there remains any thing*, that which remains is called a Fraction, and muſt be placed at ſome diſtance from the laſt Figure of the Quotient in a leſſer Character, then draw a ſmall ſtroke under it, and place your Diviſor under, as in the Examples following.

(4)	(5)	(6)
7) 54934	8) 316495	9) 314256
$7847 \frac{5}{7}$	$39561 \frac{7}{8}$	$34917 \frac{3}{9}$

VIII. *To prove your Diviſion*, Multiply your Quotient by the Diviſor, to which add the Remainder, if the Product be the ſame as your Dividend then your work is true.

8) 85436	7) 364153	9) 314254
10679 $\frac{4}{8}$	·52021 $\frac{6}{7}$	·34917 $\frac{1}{9}$
Proof 85436	364153	314254

To prove this laſt Example, where I divide by 9, I multiply 7, the Unit of my Quotient, by 9, the Diviſor, which makes 63, and the remainder I added to it, makes 64; ſo I put 4, and carry 6, and ſay, 9 times 1 is 9 and 6 is 15, 5 and carry 1; then 9 times 9 is 81, and 1 I carry is 82, 2 and carry 8; then 9 times 4 is 36 and 8 is 44, 4 and carry 9; then 9 times 3 is 27 and 4 is 31, which put down, ſo the Product is 314254, the Sum equal with the Dividend, which was to be proved.

IX. *But if the firſt Figure of the Dividend towards the left hand, be leſſer than the firſt Figure of the Diviſor,* as in the Fifth and Sixth Examples of the Seventh Rule; then make the two firſt Figures your Dividual, and proceed as before.

Other Examples of Diviſion by the foregoing Rules, without their Proofs.

	9) 51376	11) 413795	12) 413271
Quot.	5708 $\frac{4}{9}$	37617 $\frac{8}{11}$	34439 $\frac{3}{12}$
Proof	51377	413795	413271

To Divide by 11, ſay, 11 in 41, 3 times, reſt 8, which makes the 3, 83; then 11 in 83, 7 times, reſt 6, which makes the 7, 67; then 11 in

in 67, 6 times, rest 1, which makes the 9, 1[illegible] then 11 in 19, 1 time, rest 8, which makes the 85; then 11 in 85, 7 times, the remainder is $\frac{8}{11}$, so the Quotient is 37617 $\frac{8}{11}$.

And after this manner you may divide any Number by 12, 120, or 1200, as in the following Examples, the Multiplication Table being so composed as to assist you in the multiplying and dividing by 11 and 12 as readily as by any other single Figure.

X. To divide any Number by 10, 100, or 1000, as many Cyphers as you have in your Divisor, cut off so many Figures from the Unit of your Dividend, as in the following Examples.

1|0)	4150|7	1|00) 3142|67	1|000) 91|437
Quot.	4150 $\frac{7}{10}$	3142 $\frac{67}{100}$	91 $\frac{437}{1000}$

XI. *But if the Figure of the Divisor be more than a Unit, and Cyphers follow it,* in such case, as many Cyphers as you have in the Units of your Divisor, cut off so many Figures from the Unit of your Dividend, and proceed to divide as in single Figures.

	7|0) 5432|6	3|00) 84295|67
Quotient	776 $\frac{6}{70}$	28098 $\frac{1}{3}\frac{67}{00}$
Proof	54326	8429567

Various

Various Examples for the Learners Practice.

	11|0) 372045|6	12|0) 412678|5
Quotient	$33822\frac{36}{110}$	$34389\frac{105}{120}$
Proof	3720456	4126785
	11|00) 62149675	12|00) 814653|70
Quotient	$56499\frac{775}{1100}$	$67887\frac{970}{1200}$
Proof	62149675	81465370

Division *by two or more Figures*, being the hardest Lesson in Arithmetick, must be heedfully attended by the Learner, for whose Ease I shall endeavour to make the way smooth, both by Rules and Examples.

XII. *When the* Divisor *consisteth of more places than one*, then you are to set out so many Figures on the left hand of the *Dividend* for a *Dividual*, and then put a point under that Figure of the *Dividual* which stands next to the right hand.

Then seek how often the first *Figure* towards the left hand of the *Divisor*, is contained in the first *Figure* towards the left hand of the said *Dividual*, and place the Answer in the Quotient.

Then *Multiply* the whole *Divisor* by the said Figure, so placed in the *Quotient*, and place the *Product* in order under the *Dividual*.

Which being done, *subtract* the said *Product* from the *Dividual*, placing the *Remainder* below the Line.

Then

Then put a Point under the next *Figure* of *Dividend*, and annex it to the *Remainder*, so you a new *Dividual* with which you are to proc as is before directed.

Example 1.

Let it be required to Divide 8904 by 42. Here given Numbers being disposed of according to Fourth Rule of this Chapter, will stand as loweth.

42) 8904 (

Then because there are 2 places in the Divi I take the two first Figures on the left hand of Dividend for a Dividual, which is 89, puttin Point under the 9, which is that Figure of the vidual which stands next to the right hand.

Then I seek how often the first Figure (4) of Divisor, is contained in the first Figure (8) of Dividual, and the Answer is 2 times, wherefore put 2 in the Quotient, and thereby I multiply Divisor 42, and the Product is 84, which I place order under the Divjdual 89, and subtract it th from, and the remainder is 5.

Then I put a Point under the next place, wh is (o), and annex to the said remainder 5, an makes 50 for a new Dividual, and then the W will stand as followeth.

```
42) 8904 (2
     ..
    84
   ----
    50
```

In the next place I seek how often I can have the first Figure of the Divisor (which is 4) in the first Figure of the Dividual 50 (which is 5) and the Answer is 1 time, wherefore I put 1 in the Quotient, and thereby multiply the Divisor 42, and the Product is 42, which I place in order under the Dividual 50, and Subtract it therefrom, and the remainder is 8, which I place in order under the Line, and thereto annex the next Figure of the Dividend, which is 4, (having first put a Point under it) and it makes 84 for a new Dividual, and then the Work will stand as followeth.

```
42  8904 (212
    84
    ----
     50
     42
     ----
      84
      84
      ----
       0
```

3. Then I again seek how often the first Figure of the Divisor (which is 4) is contained in the first Figure of the Dividual (which is 8) and the Answer is 2 times, wherefore I put 2 in the Quotient, and thereby multiply the Divisor 42, and the Product is 84, which I place orderly under the Dividual 84, and subtract it therefrom, and there remains 0. So is the Operation ended, and I find that 8904 being divided by 42, the Quotient is 212, as by the foregoing Opperation appeareth.

XIII.

XIII. *When you have multiplied the Divisor by the Figure placed in the Quotient*, if the Product chance to be greater than the Dividual, then you may be sure that the Figure placed in the Quotient is too much; wherefore in such case you must cancel that Figure, and in the room thereof put one that is less by an Unit, and if the Product be yet bigger than the Dividual, place yet a lesser Figure than that in the Quotient, and then proceed as has been before directed.

Example 2.

Let it be required to divide 7868 by 37. The given Numbers being placed according to former Direction, I begin the Work, and first I seek how often I can have 3 (the first Figure of the Divisor) in 7 the first Figure of the Dividual 78, (having before put a point under the 8,) and the Answer is 2 times, wherefore I put 2 in the Quotient, and thereby multiply the Divisor 37, and the Product is 74, which being Subtracted from the Dividual 78, there remains 4, to which having annexed the next Figure of the Dividend (6) it makes 46 for a new Dividual. Then I proceed to seek how often 3 is contained in 4, and the answer is 1 time, wherefore I put 1 in the Quotient, and thereby multiply the Divisor 37, and the Product is 37, which being subtracted from the Dividual 46, the remainder is 9, to which the next Figure of the Dividend being annexed, *viz.* 8, it makes 98 for a new Dividual. Then I proceed to seek how often I can have 3 in 9, and the answer is 3 times, wherefore I put 3 in the Quotient, and thereby I multiply the Divisor 37, and the Product is 111, which is more than

an the Dividual, whereby I perceive that I have t a Figure too big in the Quotient; therefore cording to the directions given in the foregoing ıle, I cancel the 3, and inftead thereof I place a and then multiply the Divifor thereby, and the oduct is 74, which is leffer than the Dividual, ıerefore I make Subtraction and there remains ; and fo having never another Figure to bring ɔwn from the Dividend, I conclude the work to ended, and the Quotient thus found is 212, as the following Operation appears.

2d. Examp. 37) 7868 (213

74

46
37

98
$\cancel{111}$
74

Remainder (24)

And here note, that if at any time it fo hapens, that after you have multiplied the Divifor y the Figure laft placed in the Quotient, and ıbtracted the Product from the Dividual, if the emainder be greater than the Divifor, the Fiure laft placed in the Quotient is too little, and ıerefore it muft be cancelled, and a bigger Fiure placed in its room. What is to be done ith the remainder after Divifion is ended, fhall e fhewed in its due place, but only for the prent let it fuffice to underftand, that it is the Numerator

merator of a Fraction which is part of the Quotient, the Divisor being the Denominator to the same: So the true Quotient of the last Division is 212 $\frac{24}{27}$. But more of this hereafter.

XIV. *When* (according to the Directions given in the last Rule) *you have assigned your Dividual to consist of as many Places as the Divisor containeth places*, if then the Dividual be less then the Divisor (so that the Divisor cannot be Subtracted therefrom) you are then to annex another Figure thereto, so that then it will consist of one place more than the Divisor hath places, and then you are to seek how often the first Figure of your Divisor is contained in the two first Figures of the Dividend, and then proceed according to the Rules before delivered.

The like is to be observed in the middle of your Work, if the Dividual chance to consist of one Figure more than the Divisor, as in the following Example.

Example 3.

Let it be required to divide 4763585 by 587. Here, because the Divisor 587 consisteth of 3 places, therefore I should take the 3 first Figures to the left hand of the Dividend for a Dividual, which is 476, but because 476 is lesser than the Divisor 587, I therefore put another Figure thereto, and then I have 4763 for a Dividual, and having first put a point under the Figure 3, I begin the Division, and first I seek how often 5 (the first Figure) of the Divisor, is contained in 47 (the two first Figures of the Dividend) which I find to be 9 times, but having tryed according to

he Thirteenth Rule of this Chapter, I find 9 is
much, but it will bear 8, wherefore I put 8 in
Quotient, and having multiplied the Divisor
eby, and Subtracted the Product from the Divi-
, according to the Direction given in the
elfth Rule of this Chapter, I find the remainder
e 67, to which I annex the next Figure of the
idend, which is 5, having first put a Point under
according to the said Twelfth Rule) and then
ve 675 for a new Dividual. Then I seek how
5 (the first of the Divisor) is contained in 6
e first of the Dividend) and the answer is 1,
ch I put in the Quotient, and having Multiplied
Subtracted, I find the remainder to be 88, to
ich annexing the next Figure in the Dividend,
nakes 888 for a new Dividual, then I seek, &c.
d after Subtraction there is a Remainder of 301,
which annexing the next and last Figure of the
vidend, which is 5, it makes 3015 for a Dividu-
which consisteth of one place more than the
visor, therefore according to the latter part of
Fourteenth Rule, I seek how often 5 is contain-
in 30, and by tryal according to the Tenth Rule,
ind it will bear 5 times, wherefore I put 5 in the
otient, and having Multiplied and Subtracted, I
d the Remainder to be 80, and the work is end-
, and I find the Quotient to be $8115\frac{80}{587}$. See
following Work.

3d. Exam-

3d. Exam. 587) 4763585

Quot. 8115

```
587) 4763585
     4696
     ----
      675
      587
      ---
      888
      587
      ---
     3015
     2935
     ----
      080 Remainder.
```

Exam. Divide 72164375 by 9437.

```
9437) 66059 ... (7646 Quot.
      -----
      61053
      56622
      -----
      44317
      37748
      -----
       65695
       56622
       -----
Remainder 9073
```

Thus have I run through one sort of Divisio[n] and I hope that by this time the Learner is able [to] divide any Number given, and here let him ta[ke] notice once for all, that there must never be broug[ht] down but one Figure or Cypher at one time fro[m] the Dividend, to be annexed to the Remainder f[or] a ne[w]

new Dividual, and for every such Figure or Cypher brought down, there must be a Figure or Cypher put in the Quotient.

I might give you many more Examples of Division, wherein the Divisor may consist of 4, 5, 6, 7, 8, 9, 10, &c. places, but the Method being the very same with what is before delivered, I shall therefore forbear, and only admonish the Learner to be perfect in the foregoing Rules, and to practice well the Examples therein delivered; and for further practice, I shall give you the Quotients of four other Examples, but shall omit the Operation as a Whetstone for the Learners Ingenuity.

If you divide 2459337766 by 38462, the Quotient will be 63942, and the Remainder after the Work is finished 562.

And if you divide 4926735806877 by 5846793, the Quotient will be 842639, and there will be a Remainder of 150.

Or if you divide 1079245884216 by 1998573, the Quotient will be 540008, and there will be a Remainder of 475632.

Also if you divide 23950964141498 by 297864, the Quotient will be 8040905964, and there will be a Remainder of 80602.

There is yet a much shorter (way of) Division, by omitting to set down the Multiplication of your Divisor, (as is done in the foregoing Examples) and in this you Multiply and Subtract together: In which way the Quotient is placed under the Divisor, as being most ready and convenient for the working of any Sum. And being the most accurate and ready Way of Division, I shall pursue this Method through the remaining part of this Book, after I have given three or

D four

four Examples of one and the same Sum divided by both ways for the Learners Ease and Practice.

Let us divide the two last foregoing Sums by the short *Italian* way of Division, *viz.* the third and fourth Examples.

First of all, let be required to divide 4763585 by 587, being the third Example.

First, I proceed and ask the Question, as was shewed you in the third Example of this Rule, and say, how often 5, the first Figure of the Divisor can I have in 47, the first Figures of the Dividend? Answer, 8 times. Then Multiply 7, the Unit Figure of your Divisor, by 8, the Figure which you bring in your Quotient, and say, 8 times 7 is 56 out of 3 (the fourth Figure of the Dividend) I cannot, but 56 out of 63, rest 7, and carry 6 to the second Figure of the Divisor. Then Multiply again, and say, 8 times 8 is 64, and 6 carried is 70, out of 6 I cannot, but 70 out of 76 rest 6, and carry 7 to the first Figure of the Divisor; then multiply again, and say, 8 times 5 is 40 and 7 I carried is 47 out of 47, rest 0. So that by this Operation you find after 8 times, 587 taken out of 4763, there will remain 67, to which I take down 5, the next Figure of my Dividend for a new Dividend.

587) 4763585

8 675

Then I proceed again, and say, how often 587 (my Divisor) can I have in 675, my Dividend? The Answer is once, which I put in the Quotient, and Multiply as before, and say, once 7, out of 5 I cannot, but 7 out of 15 rest 8 and

d carry 1; then once 1 is 8, and 1 is 9, 9 out
7 I cannot, but 9 of 17, reſt 8, and carry 1;
en once 5 is 5, and one I carry is 6, 6 out of 6;
ere reſts (0) which I omit to place down, be-
uſe a (0) on the left hand is inſignificant:
hen to the Remainder 88 I take down 8, the
ext Figure of my Dividend, and it makes my new
ividend 888.

```
587) 4763585
          ..
81        675
           888
```

Then I proceed again, and ask, now often 587,
y Diviſor, can I take out 888, my Dividend, the
ſwer is once, which 1 I put in the Quotient, and ſay,
ce 7 out of 8, reſt 1; then once 8 is 8, 8 out of
reſt 0; then once 5 out of 8, reſt 3; ſo the Re-
ainder of that Diviſion is 301, to which I take
own 5, the next figure of my Dividend, which
akes my new Dividend 3015.

```
587) 4763585
          ...
811       675
           888
           3015
```

Then I proceed and ask again, how often 587
can have in my laſt Dividend 3015; the Anſwer
5 times, which 5 I place in my Quotient and
ultiply as before, and ſay 5 times 7 is 35, out
5 I cannot, but 35 out of 35, reſt, 0, and car-
3; then again, 5 times 8 is 40, and 3 I carry
43, out of 1 I cannot, but 43 out of 51, reſt

 8,

8, and carry 5; then laſtly, 5 times 5 is 25, an[d] 5 I carry is 30, 30 out of 30 reſt 0. So my R[e]mainder of this laſt Diviſion is 80, which I cut o[ff] with a ſtroke from the reſt of the Work to ſigni[fy] it to be a Remainder, and my whole Operation [of] the Sum ſtands as followeth.

Example I.

```
                     Dividend.
Diviſor        587)  4763585
               ----
Quotient      8116      675
                        888
                       3015
                       ----
                         80  Remainder.
```

Example II.

```
           9437)  Divide 72164375 by 9437.
           ----
Quotient   7646             61053
           ----              44317
          56622               65695
         37748                -----
        56622                  9073
       66059
       --------
       72155302
           9073
       --------
       72164375
```

Proof, is to Multiply the Quo[ti]ent by the Diviſor, and to the Product add the R[e]mainder.

Examples of the short Italian *way of Division for the Learners Practice, with their Proofs.*

```
            297546)          148975182883 5
                                  ·······

Quotient    5006765            02021828
            297546             .2365528
                                  2827063
            30040770               1491495
           20027180           ------------
          25033975                 03765
         35047565
        45061155
       10013590
       ------------
       148975182507 0
                3765 Remainder.
       ------------
       148975182883 5 Proof.
```

The same Examples after the long Italian *way of Division, with their Proof.*

```
       297546)  148975182883 5  (5006795
                1487730······
                -------------
                   2021828
                   1785276
                   -------
                    2365528
                    2082822
                    -------
                     2827063
                     2677914
                     -------
                      1491495
                      1487730
                      -------
           Remainder     3765
```

To prove your Division.

1. Multiply your Quotient by your Divisor (to the Product add your Remainder, if any be) Sum of all added together will be equal to yo Dividend, if your Work be true. Or,

2. You may take the several Products that placed under each *Dividual* (in this way of Di sion,) and place them in the same order as th there stand in respect to one another, and to th Sum add the Remainder, and the *Proof* will sta as followeth.

```
1487730
 1785276
  2082822
   2677914
    1487730
        3765  Remainder.
————————————
148975182835 Proof
```

O R,

You may also prove Division by casting out t Nines thus.

First make a Cross, then cast the Nines out your Divisor, and place the remainder on the l side of the Cross. *Then* cast the Nines out of yo Quotient, and place the remainder opposite to t other on the right side of the Cross; *Multi* these two Figures together, and out of your P duct cast the Nines, the overplus carry to the R mainder, and continue to cast out all the Nin therefrom, and the remainder above Nine pla on the top of the Cross. Lastly, cast the Nin

on

ut of your Dividend, and if that remainder comes o be the ſame Figure with that placed on the top, our Sum is true; then place the laſt Figure at the ottom of your Croſs.

But the moſt certain Proof of *Diviſion*, (as I ſhew-ed before) is by *Multiplication*; and the moſt cer-tain Proof of *Multiplication* is by *Diviſion*, they in-terchangeably proving each other.

For if you divide the *Product* by the *Multipli-cand*, the *Quotient* will be equal to the *Multiplier*.

If you divide the *Product* by the *Multiplier*, the *Quotient* will be equal to to the *Multiplicand*.

An Example or two will make this Proof of Di-viſion plain.

	(1)		(2)	
		Dividend.		
Diviſor	754)	912673	457)	159137
		1586		2203
Quotient	1210	787	348	3757
		333		101

In the firſt of theſe two laſt Examples my Di-viſor is 754, Quotient is 1210, Remainder is 333, and Dividend 912673. *To prove which*, make a Croſs, as in the Margent: Then caſt the Nines out of the Diviſor, there will re-main 7, which I place on the left ſide of the Croſs, then caſt the Nines out of the Quotient, reſt 4, Multiply 7 by 4, it makes 28, caſt out the Nines, reſt 1, which I carry to the remainder, and ſay, 1 and 3 is 4, and 3 is 7, and 3 is 10, caſt out 9, reſt 1, which I place above the Croſs.

	1	
7	+	4
	1	

 Laſtly,

Lastly, cast the Nines out of your Dividend : a there will rest 1, which place under the Cross : a your Sum is true.

XV. When the *Divisor* consisteth of any oth Number with a Cypher or Cyphers annexed there then cut off the Cyphers of the *Divisor* with a da of the Pen, and as many Cyphers as you cut off fro the Divisor, so many places must you cut off fro the *Dividend*; then proceed to divide the remaini Figures of the *Divisor*, as if there were no su Cyphers or Figures in the *Divisor* or *Dividend* as yo cut off, and if nothing remain after *Division* is ende then shall the figures you cut off from the given Di*vidend* be the true Remainder ; but if any thing remain after *Division* is ended, you are there annex the figures of the *Dividend* that were befo cut off, so shall the said remainder with the Figur annexed thereto be the true remainder.

Example.

Divide 486783 by 15000. First, I cut off th three Cyphers of the *Divisor*, and also three plac of the right hand of the *Dividend*, so have I 15 fo my Divisor, and 486 for my Dividend, *viz.*

```
15|000) 486|793 (32
        45
        --
         36
         30
         --
          6
```

Th

The same short way of Division.

```
15|000) 486|793
-------  36
32      ----
          6
```

Here I find the *Quotient* to be 32, and the remainder is 6, to which annexing the Figures cut off from the *Dividend, viz.* 793, it makes 6793 for the true Remainder.

Having thus enlarged and finished the first Fundamental Rules of *Arithmetick*, their Application shall be more particularly taught in the following Chapters.

CHAP. VI.

Of REDUCTION.

REDUCTION *Teacheth to Reduce Numbers, whether Money, Weight, Measure, Time, Motion,* &c. *from one Denomination to another, discovering the same value, but in different Terms.*

II. The whole Work of Reduction is performed by Multiplication and Division.

III. All great Denominations are brought into lesser of the same value by Multiplication, and this is by some called *REDUCTION DESCENDING.*

IV. All *small* Denominations are reduced into greater of the same value by *Division*; and

and this is by some called *REDUCTION ASCENDING.*

V. *To reduce greater Denominations into lesser of the same value*, Consider how many of the *Lesser* are equal to one of the *Greater*, and multiply the given Number thereby, so shall the Product be the Answer to the Question.

Example.

Reduce 3468 *Shillings into Pence.*

3468 12 ——— *fac.* 41616 *Pence.*	Here I consider that 12 *Pence* is a *Shilling*, and the *Pence* ought to be 12 times the number of *Shillings*, wherefore I multiply by 12 at one Operation, accord-

ing to the Fourteenth Rule of the fourth Chapter, and the Product is 41616 *Pence*, as in the Margent.

VI. *To Reduce Smaller Denominations into Greater*, Consider how many of the *Smaller* are equal to one of the *Greater*, and divide thereby, the Quotient is the Answer to the Question.

Example.

Reduce 41616 *Pence into Shillings.*

12) 41616 ——— *fac.* 3468 *Shil.*	First, consider that 12 *Pence* is a *Shilling*, and that the *Shillings* ought to be a twelfth part of the *Pence*; wherefore I divide the given

Number by 12 at one Operation, as was shewed you in the Eleventh Rule of the Fifth Chapter

Chapter, and say, 12 in 41, 3 times, rest 5 to the 6 makes it 56, then 12 in 56, 4 times, rest 8, which makes the 1, 81; then 12 in 81, 6 times, rest 9, which makes the 6. 96; then 12 in 96, is 8 times, and the Quotient gives me 3468 *Shillings*, which is the Answer to the Question, and may serve for a Proof of the foregoing Example.

Note, I would Advise the Learner to inure himself to the most short and ready ways of Multiplication and Division, which will very much contract the Operations in Reduction, *viz.* In Reduction of Money, to multiply the *Shillings* by 12 at one Operation as in Chap. 4. of Multiplication, Rule 14. And likewise to divide by 12 at one Operation, as in the 9th and 11th Rules of the fifth Chapter.

For your further assistance in Reduction you ought to have respect to the Tables of *Coyn*, *Weight*, *Measure*, *&c.* delivered in the second Chapter.

Example I.

In 685 l. I demand how many Shillings, Pence, and Farthings?

First, I multiply by 20 (because 20 *Shillings* is a *Pound*) and the Product is 13700 *Shillings*, then I multiply the *Shillings*, by 12, (because 12 *Pence*, is a *Shilling*) and the Product is 164400 *Pence*, then I multiply the *Farthings* by 4, (because 4 *Farthings* is a *Peny*,) and the Product is 657600 *Farthings* as in the Margent.

	685 *Pounds*
	20
	13700 *Shill.*
	12
	164400 *Pence.*
	4
fa.	657600 *Farth.*

This

This or any other number of *Pounds* might be reduced into *Pence* or *Farthings* at one Operation without reducing it into the intermediate Denominations.

For if you multiply *Pounds* by 240 (because so many *Pence make a Pound)* the Product will be *Pence*; and if you multiply *Pounds* by 960 (because 960 *Farthings* is a *Pound)* the Product will be *Farthings*: So in the foregoing Example 685 *l.* being multiplied by 240, the product you will find to be 164400 *Pence*; and if you multiply 685 *l.* by 960, the Product will be 657600 *Farthings*, for the Reasons before said.

20 *Shill.*
12
———
240 *Pence*
4
———
960 *Farth.*
one Pound.

But you may say, you cannot well remember how many *Pence* or *Farthings* make a *Pound*, I will therefore teach you how to find it out at any time when you have occasion. You may easily remember that 20 *Shillings* is a *Pound*, and that multiplied by 12 produceth 240 *Pence*, which being multiplied by 4 produceth 960 *Farthings*, as in the Margent.

Example II.

In 657600 *Farthings, I demand how many Pence, Shillings, and Pounds?*

This Question is the Reverse of the former, and may serve for a Proof thereof: First I divide the *Farthings* by 4, and the *Quotient* is 164400 *Pence*, then I divide the *Pence* by 12, and the *Quotient* is 13700 *Shillings*, and the *Shillings* I divide by 20, and the *Quotient* is 685 *Pounds*; which is equal to the given Number in the first Example. See the whole Operation as followeth:

4)

4) 657600 Farthings.

12) 164400 Pence.

2|0) 1370|0 Shillings.

Facit 685 Pound.

VII. *When in Reduction Descending*, the Number opounded to be reduced consisteth of divers Deominations, as of *Pounds*, *Shillings*, *Pence*, and *urthings*, or of *Pounds*, *Ounces*, *Penny Weights*, and *rains*, &c. then you may readily reduce it into e lowest Denomination, thus when you reduce an igher Denomination into the next inferiour, add the Product the expressed parts into which you educe it, as if you were to reduce *Pounds* into *hillings*, add to the Product (as you multiply) the *hillings*, that are expressed in the Number proounded; proceed in the same method till ye have educed the given Number into the Denomination equired, as in the following Example.

Example III.

Reduce 567 *l.* 15 *s.* 6*d.* $\frac{3}{4}$. *into Farthings.*

First, I multiply by 20 to bring into *Shillings* aying, 0 times 7 is 0, but 5 is 5, (taking in the 5 that is in the place of Units in the *Rank of Shillings*, and setting it in the place of Units in the Product;) then 2 times 7 is 14, and 1 is 15, taking in the 1 that is in the place of Tens in the *Rank of Shillings*) so I set down 5 in the place of Tens in the Product, *&c.* the Product is 11355 *Shillings*; then I multiply the *Shillings* by

12

12 to bring them into *Pence*, ſaying, 12 times 5 is 60, and 6 is 66, (taking in the 6 that ſtands in the *Rank of Pence*,) *&c.* and the *Pence* make 13626[6] then I multiply my *Pence* by 4 to bring them into *Farthings*, ſaying, 4 times 6 is 24, and 3 is 27 taking in the 3 which ſtands in the *Rank of Farthings*, *&c.* ſo the *Farthings* amount to 545067, as by the whole Operation appeareth, *viz.*

567 *l.* —15 *s.* —6 *d.* $\frac{3}{4}$	
20	
11355	*Shillings.*
12	
136266	*Pence.*
4	
545067	*Farthings.*

Obſerve the like in any other Example.

VIII. *When in Reduction Aſcending* any thing remains after Diviſion is ended, it is always of the ſame Denomination with the Dividend, as in the following Example.

Example IV.

In 545067 Farthings, I demand how many Pounds?

Firſt, I divide the given Number of *Farthings* by 4, and the *Quotient* is 136266 *Pence*, and there remains 3, which is 3 *Farthings*, becauſe the Dividend was *Farthings*.

Then

Then I divide the *Pence* by 12, and the *Quotient* 11355 *Shillings*, and there remaineth 6, which 6 *Pence*, because the Dividend was *Pence*.

Then I divide the *Shillings* by 20, and the *Quotient* is 567 *l.* and there remaineth 15, which is *illings*, because the Dividend was *Shillings*: So at I find by the work, 545067 *Farthings* to be 7 *l.* 15 *s.* 6 *d.* $\frac{3}{4}$ as by the following work.

4) 545067

12) 136266 $\frac{3}{4}$

2|0) 1135|5 : 6*d.*

Facit lb. 567 15 *s.* 6 *d.* $\frac{3}{4}$

This Question is the inverse of the *Third Example*, nd may very well serve for a Proof thereof, as you ay observe at your Leisure.

Here by the way take notice, that when you are to Divide any Number by 20, that is) to bring *hillings* into *Pounds*, the best way is to cut off a igure to the right hand for *Shillings*, and then to ake half the Figures to the left hand for *Pounds*, nd if one remain it is 10 *Shillings* to be added to he Figure first cut off. For *Example*:

Where 11355 *Shillings is to be reduced into Pounds*, cut off the last Figure 5 for Shillings, and say, alf of 11 is 5, half of 13 is 6, half of 15 is 7, and there remains 1, which make the 5 Shillings to be 15 Shillings; and this Method shall be observed hereafter.

1135| 5 *s.* *d.*

fac. 567—15—0

NOTE

NOTE once for all, That Reduction *Ascend*[...] proves Reduction *Descending*, the one being a [...] verse to the other, as shall be demonstrated in [...] ensuing Questions that follow over Leaf in all [...] Varieties of Reduction.

In 7642 l. 17 s. 11 d. $\frac{1}{8}$ *I demand how ma*[...] *(half Farthings*

```
    20
 ------
 152857 Shill.
     12
 -------
 1834295
       8
 --------
fa. 14674361 half Farthings.
```

Tun. C. qr. ℔.

Quest. 1. *In* 95 : 11 : 3 : 15 *how many Poun*[...] *Averdupois Weight* *(Weight*

```
        20
      ----
      1911 hundred
        44
      ----
      7647 quarters.
        28
     -----
     61181
    15295
    ------
Facit 214131
```

Quest.

C. qr. lb. oz.
Queſt. 2. *In* 50 : 2 : 15 : 9 *how many Ounces?*

```
 4
----
 202
  28
----
1621
405
----
5671
  16
-----
34035
5671
-----
```

Facit 90745 *Ounces.*

By this you ſee that if 50 *C.* 2 *qr.* 15 lb. 9 *oz.* be *Multiplied* according to the Directions given in the 7th Rule of this Chapter, the Product will be 90745 Ounces, which is the Reverſe or Proof of the ſecond Queſtion oppoſite to this on the right hand.

Queſt. 1. *In* 214131 *Pound Weight how many (Tuns?*

```
  28)  181
-----  133
4) 7647  211
------- -----
2|0) 191|1 3/4   15 Pound.
-------------
```

Proof 95 : 11 : 3 : 15. By this you ſee that if 214131 Pound Weight be *Divided* by 28, by 4, and 20, it will produce 25 *Tun,* 11 *C.* 3 *qrs.* 15

15 lb. which is the Reverse of the first Question the left hand.

Quest. 2. *In* 90745 *Ounces how many hund* (*weigh*

```
            16) 107
 ———— ————    114
  28) 5671     25
  ————  71  ————
4) 202 ——      9 Ounces.
 ————————15
50 : 2 : 15 : 9 Proof.
```

```
                 ℥.  dwt.  gr.
Quest. 3.  In 50 : 10 : 11 how many Grains
Troy   }        20                  (Silver
Weight }  ————————
              1010
                24
            ——————
              4041
             2021
            ——————
Facit       24251 Grains of Silver.
```

```
          oz. p.w. gr.
Quest. 3. 507—10—11 how many Grains of Si
Troy   }     20                        (ver
Weight }-————————
          10150 penny weight.
             24
        ——————
          40601
         20301
        ——————
Fac.    243611 grains.
```

Tun. hh. gal.
Queſt. 4. *In* 54—2—25 *how many Quarts of (Wine?*
Liquid Meaſure

```
  4
-----
 218  hhead.
  63
-----
  659
 1310
-----
13759  gallons.
    4
-----
Proof 55036  quarts.
```

Laſt, qr. buſh. gall.
Queſt. 5. *In* 75—5—3—2 *how many Gallons of (Wheat?*
Dry Meaſure

```
  10
-----
 755  quarters.
   8
-----
6043  buſhels.
-----
Fac. 48346  gallons.
```

Queſt. 3. *In* 243611 *Grains how many Ounces of (Silver?*

```
        24)  36
------------ 121
2|0 1015|0   ---
------------  11
Proof 507 : 10 p. w. 11 Grains.
```

Queſt.

Quest. 4. *In 55036 Quarts how many Tun[s] (W[ine])*

```
        4)  55036
       63)  13739
      ----    115
  4)  218     529
  --------  -----
       54      25 Gall.
  Fac. 54  2hh. 25 Gall.
```

Quest. 5. *In 48346 Gallons how many Last[s] (Whea[t])*

```
  8) 48346
  ----------
  8) 6043 : 2
  ----------
  10  75|5 : 3
  ----------
  Proof 75 : 5 : 3 : 2
```

By the foregoing Examples the Learner may [be] sufficiently instructed in the working and provi[ng] any Sum in Reduction. I shall forbear to give y[ou] any more Examples of this Nature, my design bei[ng] to improve the remaining Paper with Matter mo[re] useful, after I have given three or four more Exam[m]ples in *Cloth Measure*, and *Reduction of Time.*

Cloth Measure.

Quest. 6. *In 207 Ells, 2 quarters, 2 nails, ho[w] (many Nail[s])*

```
   5
  ----
  1037 quarters
     4
  ----
  Fa. 4150 Nails.
```

Quest[.]

Queſt. 7. *In* 107 *Yards,* 3 *quarters* 1 *Nail, (how many Nails?*
4

431 *quarters.*
4

Fa. 1725 *Nails.*

Queſt. 8. *In* 312 *Ells Flem.* 2 *qrs. how many (Quarters?*
3

938 *quarters.*

Queſt. 9. *In* 112 *Aulns,* 1 *qr.* 2. *Nails, how (many Nails?*
6

673 *quarters.*
4
Fa. 2654 *Nails.*

Long

Long Measure.

Queſt. 10. *The Circumference of the Earth* i*s* 360 *Degrees, and every Degree* 60 Engliſh *Mil* *I demand how many Miles, Furlongs, Perc* *Inches, and Barley Corns will reach round* *World?*

360	*Degrees.*
60	*Miles a Degree.*
21600	*Miles about the Earth.*
8	
172800	*Furlongs about the Earth.*
40	*Perches in a Mile.*
6912000	*Perches about the Earth.*
33	*Half Feet in a Perch.*
20736000	
20736000	
228096000	*Half Feet about the Earth.*
6	*Inches in a half Foot.*
1368576000	*Inches.*
3	*Barly Corns in an Inch.*
4105728000	*Barly Corns about the Earth.*

Queſt

ſt. 11. *I demand how many Days, Hours, and* *inutes it is ſince the Birth of our Saviour Jeſus* *hriſt, to this preſent Year* 1701.

1701 *Years.*
365 *Days in a Year.*

8505
10206
5103

620865 *Days ſince the Birth of Chriſt.*
24 *Hours in one Day.*

2483460
1241730

14900760
10206 *hours added.*

14910966 *Hours ſince the Birth of Chriſt.*
60 *Minutes in an hour.*

894657960 *Minutes ſince the Birth of Chriſt.*

1701
6

10206 *hours to be added.*

Note, That 6 Hours is loſt in every Year, to rrect which, you multiply the Number of Years be reduced by 6, and the Product will give you Hours to be added to the given Time, as you y ſee in the Example above.

R E D U C T I O N (according to the firſt Rule this Chapter) Teacheth you alſo to Reduce the yns. *Weights*, and *Meaſures* of one Country into *Coyns*, *Weights*, and *Meaſures* of any other untry. As for Example.

eſt. 1. *I have bought* 3507 *Ells* Flemiſh *of Genting* *Cloth, I would know how many Ells* Engliſh *is con-* *tained therein.*

The

The most Practical way to work this, is to Multiply the Ells *Flemish* by 6, and Divide by 10, which contracts the Work, because to Divide by 10 is only to cut off the last Figure of the Dividend. And the Reason is this, there is 6 half quarters of a Yard in an Ell *Flemish*: And there is 10 half quarters of a Yard in an Ell *English*: The Work stands, *viz.*

3507 *Ells Engl.*
6 *fa.* 2104 $\frac{2}{10}$, *which is equal to* $\frac{1}{5}$ *the quarter of an Ell* English.
2104|2

Quest 2. *In* 4215 $\frac{1}{2}$ *Ells* Flemish *how many Ells* (English.
6
Ells Engl.
2529|3 *fa.* 2529 and $\frac{3}{10}$ *or three half quarters.*

Quest 3. *In* 295 *Ells* English *how many* Portugal (*Veres of* 15 *Nails*
20
15) 5900
140
393 50
Veres.
5 *fa.* 393 $\frac{5}{15}$.

s. d.
Quest. 4. *In* 205 *Pistoles, at* 17 6 *how many Pounds* (*Sterling*
210 12
2050 210
410
24|0) 4305|0 *Pence in all the Pistoles.*
190
179 225
9 *fa.* 179 *l.* and 90 *Pence.*

Quest

eft. 5. In an Ingot of Silver, Quantity 24 lb. 7 oz. *how many Salvers, quantity* 12 oz. $\frac{1}{2}$.

```
          lb.  oz.
          24   7
          12         12 1/2
         ----        ------
         295           25
           2
      --------
  25)  590   half Ounces.
  ---   90
  23 -----
        15   fa. 23 Salvers, and 15
                 half Ounces.
```

eft. 6. In 142 C. 3 qr. 19 lb. *of Sugar, how many (Boxes of* 84 lb.

```
       4
     -----
     571
      28
    ------
    4577
    1143
    ------
 84)  16007 Pound Weight.
 ---    706
 190 -------- Boxes.  lb.
    47 fa. 190 and 47 of Sugar.
```

Quest. 7. *In* 35 *l.* 11 *s.* 4 *d.* *how many Dollars* (4 *s.* 6

```
        35        4
        20       12
       ---       --
       711       54
        12
       ----
  54)  8536
  ---   313
  158   436
       ----
         4  fa. 158 Dollars and 4 Pence.
```

Quest. 8. *In* 75 *Hogsheads of Wine how many Runl* (*of* 22 *Gallon*

```
        75
        63
       ----
       225
       450
       ----
  22)  4725
  ---    32
  214   105
       ----          Runl.
        17      fa. 214 and 17 Gallons.
```

Quest. 9. *In* 905 *Guinea's, at* 21 *s.* 10 *d.* $\frac{5}{8}$ *many Pistols, at* 17 *s.* 6 *d.*

```
                      s.   d.           s.
          905 ------ 21 : 10 5/8 ------ 17 :
         2101        12                 12
         ----        ---                ---
          905        262               210
         9050          8                 8
        1810         ----              ----
        -----        2101              1680
168|0) 190140|5
-----    221
 1131    534
          300
         -----   Pistols.
          132  fa. 1131 and 1325 half Farth
```

Qu

eft. 10. *Bought at* Bourdeaux 10-*Pieces of Pruans,*
uantity 95 *Quintals, I demand how many C.Weight*
t makes in London ?

```
    95      Note, 100 lb. is a Quintal.
   100
  ----
12) 9500
--  540
84-----      C.   lb.
     92 fa. 84—92 in London.
```

eft. 11. *A Merchant at* London *receives an In-*
voyce from his Correspondent at Jamaica *of several*
Hogsheads of Sugar, Quantity 195 C. 1 qr. 16 lb.
at Jamaica, *I demand what Weight they produce at*
London?

```
  C.  qr. lb.
  195—1—16
        4
  -------
      781
       25
  -------
     3911
    1563
  -------
2) 19541
--   834
4    501
  -------    C.   lb.
     53 fac. 174—53 in London.
```

CHAP. VII.

The Golden Rule, or Rule of Three Direct.

I. THE *Rule of Three* is so called, because in there are always *three Numbers* given to fi out a *fourth*. It is also called *the Golden Rule*, its excellent Performances in the Art of Number

II. The Rule of Three is either *Single* or *Co pound*.

III. The *Single* Rule of Three is either *Dire* or *Inverse*.

IV. *The single Rule of three Direct*, is when th are *three Numbers* given to find out a *fourth* in a rect Proportion; That is, when the *fourth* Numb ought to bear such Proportion to the *third* as second doth to the *first*; Or, as the *first* is in pr portion to the *second*, so is the *third* to the *fou* This is called a direct Proportion.

V. *In the single Rule of Three*, the two first the given Numbers imply a Supposition, and third a Demand.

VI. The *three given Numbers* must be ranked such order, as that the Number to which the mand is affixed may possess the *third* place, and t Number in the Supposition, that is of the sa Name, Kind, or Quality with that in the *third* pl must possess the *first* place, and the other Num in the Supposition must possess the *second* place, is evermore of the same Name, Kind, or Qua with the Number sought.

Example. If 18 *Yards of Camblet cost* 72 *s.* w *will* 596 *Yards cost at that Rate?*

In this Example the Suppoſition is this, *viz.* If 8 Yards coſt 72 Shillings. And in the other Numr (596) is implied a Demand, *viz.* What will 96 Yards coſt? Therefore muſt 596 Yards be the *ird* Number, and that Number in the Suppoſition hich is of the ſame kind with 596 muſt be the *ſt* Number, which here is 18, becauſe that ſignieth Yards as well as the *third* Number; and the ther Number in the Suppoſition, which here is 2, is the *ſecond* Number, and is of the ſame kind ith the *fourth* Number, or Number ſought; for e Number ſought by the Queſtion is the Price of 96 Yards, and the *ſecond* Number is the Price of e *firſt*, *viz.* 72 Shillings. Now the given Number eing duly ſtated and ranked according to the foreoing Directions will ſtand thus,

yrds.	*s.*	*yrds.*
18 ———	—— 72 ———	596

VII. *In the ſingle Rule of Three Direct, if you Multiply the ſecond Number by the third, or (which is ll one) the third Number by the ſecond, and divide the Product thereof by the firſt, the Quotient thence riſing is the fourth Proportional Number ſought, or Anſwer to the Queſtion.* As in the foregoing Example, *viz.* If 18 Yards of Camblet coſt 72 Shillings, what will 596 Yards coſt at that rate? The Numbers given in the Queſtion being ranked according o the Directions given in the ſixth Rule, I multiply the *ſecond* Number (72) by (596) the *third* Number, and the Product is 42912 which being divided by (18) the *firſt* Number, the Quotient is 2384, which is the *fourth* Number, or Anſwer to the Queſtion. See the whole Operation as followeth, *viz.*

yrds.	*s.*		*yrds.*
18 give	72	what will	596

```
                              596
                               72
                             ----
                             1192
                            4172
                            -----
                    18) 42912 shill.
                    ---  69
               fa. 2384  151
                shill.    72
                         ---
                           0
```

VIII. When (according to the foregoing Directi-ons) you have found out the *Answer* to the *Questi*-you are always to esteem it of the same Name th-your *second* Number was of, or reduced to. So th-in the foregoing Example, the Answer to the Qu-stion is 2384 *Shillings*, because the *second* Number-72 *Shillings*. And if the *second* Number had bee-reduced into *Pence*, it makes 864, and then the An-swer would have been 28608 *Pence*, as by the fo-llowing Operation appears.

```
yards.       s.                  yards.
  18 give ——— 72 ——— what will 596
              12                 864
             ———               ———————
             864                 2384
                                3576
                               4768
                              ———————
                          18) 514944
                   ———————    154
               fa. 28608      109
                                144
                                ———
                                  0
```

Fa. 28608 pence, equal to 2384 shillings.

Likewise if the *second* Number had been reduced into *Farthings*, it would have been 3456, which being multiplied by (596) the *third* Number, the Product is 2059776, which being divided by (18) the *first* Number, the Quotient is 114432 *Farthings*, equal to 119 *l.* 4 *s* as before; which you may prove at your leisure.

IX. When the *second* Number consisteth of divers Denominations, as, of *Pounds* and *Shillings*, or of *Pounds*, *Shillings*, and *Pence*, then you must reduce it to the lowest name mentioned, or lower if you please, and then multiply the *second* by the *third*, and divide the Product by the *first*, &c. as before directed.

Example II.

If 26 Yards of Broad Cloth cost 12 l. 02 s. 08 *what will 248 Yards of the same cost at that Rate?*

The given Numbers in the Example being ranged according to the Directions given in the Sixt Rule aforegoing will stand thus,

yds.	l.	s.	d.	yds.
26 ——	12 ——	02 ——	08 ——	248

Here the *second* Number consisteth of divers Denominations, *viz.* *Pounds*, *Shillings*, and *Pence* Therefore must it be reduced to the lowest Name mentioned, which is *Pence*, and it makes 2912 which being Multiplied by (248) the *third* Number, the Product is 722176, which being divided by (26) the *first* Number, the Quotient is 2777 *Pence*, because the *second* Number was reduced into *Pence*, which is the Answer to the Question, and may be reduced to 115 *l.* 14 *s.* 08 *d.* As you may see by the following Operation.

```
yrds.         l.  s.  d.          yrds.
 20 ——give 12—02—08 ——what 248
           20
          ———
          242 shillings.
           12
          ————
          2912
           248
         ——————
         23296
        11648
        5824
        ——————
    26) 722176
    —·  202
2) 27776 d.  201
             197
|0) 231|4 : 8  156
   ————————    ———
   115 : 14 : 8  0

         s.  d.
a.  115 : 14 : 8
```

X. If the *first* and *third* Numbers, or either f them, consist of divers Denominations, then nust they be both reduced to the lowest Denomination mentioned in either of them, as if the *first* Number be Hundred Weights only, and the *third* be Hundreds, Quarters, and Pounds, then nust they be both reduced into Pounds, because Pounds are mentioned in the *third* Number. Or if the *first* and *third Numbers* being of one kind, are notwithstanding of different Denomina- tions,

nations, then must they be reduced to one Deno-mination, as if the *first* be Pounds of Weight, and the *third* be Hundred Weights, then must the *third* Number be reduced to Pounds as in the *first*.

Example III.

If 1 *C. Weight of Tobacco cost* 4 l. 5 s. 2 d. *what will* 34 *C.* 3 *qrs.* 18 lb. *cost at that rate?*

In this Example, because the *third* Number has *Pounds* mentioned therein, therefore must the *first* and *third* Numbers be both reduced to *Pounds*, and the *second* Number, which is 4 *l.* 05 *s.* 02 *d.* must be reduced into *Pence* by the fifth Rule of Chap. V. and then the *second* Number being multiplied by the *third* the Product is 3996020, which being divided by the *first*, the Quotient is 35678 Pence, which is equal to 148 *l.* 13 *s.* 02 *d.* and 84 remaineth, and how that or any other such like remainder may be ordered, shall be taught by and by. See the following Operation.

```
lb.        l.  s.  d.             C. qr. lb.
112 cost   4 — 5 — 2 ———————— 34 — 3 — 18
           20                     4
          ———                   ———
           85                   139
           12                    28
          ————                  ————
         1022 pence.            1120
                                 279
                                ————
                                3910
                                1022
                                ————
                                7820
                                7820
                               39100
                               ———————
            112)               3996020
           ———————              636
         12) 35678              760
           ———————              882
            297| 3 : 2d.        980        84
           ——————————          ————        ——
Facit  148 : 13 : 2 84/112      84         42
```

Example.

If 14 lb. *of Sugar cost* 5 s. 3 d: *what will* 46 C. *Weight cost at that rate?*

In this Example the *third* Number must be reduced into *Pounds*, because the first Number is Pounds, and it makes 5152, and the second Number must be reduced into Pence, making 63 then the

the second number being multiplied by the third the Product is 324576, which being divided by (14) the first Number, the Quotient is 23184 Pence for the Answer; which is equal to 96 *l.* 12 *s.* as by the following Operation appears.

```
lb.              s.        d.              C.
14———————Sugar   5- ————   3————————  ————466
                 12                        1122
                 —                         ————
                 63                         922
                                           506
                                          ————
                                          51522
                                            633
                                        ———————
                                         154566
                                         30912
                                        ———————
                              14)  324576
               12)  23184—— 44
               ———————————       25
                    193|2          117
               ———————————          56
                                    —
          facit  96. 12 s.          0
```

XI. When you have multiplied the second Number by the third, and divided the Product thereof by the first. If any thing remain after Division is ended, it is part of an Unit in the Quotient, and its value may be found out thus, *viz.*

Multiply the said Remainder by the parts of the next inferior Denomination that are equal to an Unit of the Quotient, and divide that Product by the first Number, so shall the Quotient be the

value of the said remainder in the said parts, l if any thing yet remain, multiply it by the ts of the next inferior Denomination, that are al to an Unit of the last Quotient, and divide Product by the said Number, &c. Proceed s till you have brought it as low as your desire: d if any thing remain at last of all, it is a part an Unit of the least Denomination into which u reduce the said Remainder, and must be placed cording to the Direction given in the fourth Rule the fifth Chapter.

In the third Example foregoing after the Division ended, there is a remainder of 84, which sheweth at the Answer to the Question is not exactly 35678 nce, or 148 *l.* 13 *s.* 02 *d.* as it is there found, t it is something more; therefore to find the lue of this Remainder 84, I multiply it by 4, because 35678 the said Quotient is Pence) and e Product is 336, which I divide by the first umber 112, and the Quotient is 3 Farthings, ithout any other Remainder, and so is the true nswer to that question 148 *l.* 13 *s.* 02 *d.* $\frac{3}{4}$. ind the Operation of the next Example.

Example

Example V.

If 1 C. *Weight of Currants cost* 2 l. 14 s. *what* w
24 C. 3 *qrs.* 16 lb. *cost at that rate?*

```
lb.      l.     s.        C      qrs.     lb.
112 ——— 2 ——— 14         24 ——— 3 ——— 16
        20                4
        ——               ——
        54               99
                         28
                         ———
                         798
                         199
                         ————
                         2788
                           54
                         —————
                         11152
                         13940
                         ——————
             112)        150552
             ————          385
 facit. { shill. 1344      495
          ————             472
        { pence  2         ———
          ————              24
        { farth. 2          12
                           ———
                           288
                           ———
                            64
                             4
                           ———
                           256
                            32
```

In the Work of the foregoing Example, you may observe that the second Number is reduced no

o lower than Shillings, making 54; therefore e Quotient is 1344 Shillings, equal to 67 *l.* 4 *s.* nd there is a Remainder of 24: therefore to find ut how many Pence is contained therein, I multi-ly it by 12, and the Product is 288, which being ivided by 112 (because that is the first Number) ne Quotient is 2 Pence, and there is a Remainder f 64, which I multiply by 4, (to find its Value in Farthings,) and the Product is 256, which I divide gain by 112, and the Quotient is 2 Farthings, and here is a Remainder of 32, which according to the th. Rule of Chapter VI. is $\frac{32}{112}$ of a Farthing; and o the Answer to the Question is 67 *l.* 04 *s.* 2 *d.* *qrs.* $\frac{32}{112}$. The like may be observed of any other.

Example VI.

If 24 *Yards of Camblet cost* 4 l. 16 s. *I demand how many Yards I may buy for* 126 l. *Facit* 360 yds. The Terms being ranked as is directed in the Sixth Rule of this Chapter, will stand thus, *viz.*

```
l.  s.          yds.          l.
4—16 ————— 24 ————— 126
20                           20
——                          ———
96                          2520
                              24
                           —————
                           10080
                           5040
                           —————
                  96)  60480
                  ——    288
                  630  ————
                          00
```

Having

Having thus demonstrated the reason of the *Single Rule of Three Direct* in the six foregoing Examples, I shall proceed now to propose several Questions in the Rule of Three for the Learners Practice and only set down their *Facits*, as a further help to them in the working of their Questions.

Question 1. If an Ounce of Silver cost 5 *s.* 4 *d.* what will 46 *oz.* 15 *pw.* 12 *gr.* cost? *Facit* 12 *l.* 09 *s.* 5 *d.* $\frac{288}{480}$.

Quest. 2. If 12 Yards of Broad-cloth cost 7 *l.* 6 *s.* I demand how much I ought to give for 26 Pieces, each Piece containing 27 Yards? *Facit* 427 *l.* 1 *s.*

Quest. 3. If 18 Yards of *Cambrick* cost 4 *l.* 13 *s.* I demand the Price of 73 Pieces, each Piece containing 34 Ells *Flemish*? The Ell *Flemish* being 3 quarters of a Yard? *Facit* 480 *l.* 17 *s.* 9 *d.*

Quest. 4. If 17 C. 3 qrs. 17 ℔. of Tobacco cost 145 *l.* 12 *s.* I demand how much the Ounce stands me in at that rate? *Facit* 1 *d.* $\frac{2664}{3980}$ *per* Ounce.

Quest. 5. If 112 ℔ of Lead cost 15 *s.* 11 *d.* I demand the Price of 54 Fother, each being 19 C. $\frac{1}{2}$? *Facit* 838 *l.* 0 *s.* 3 *d.*

Quest. 6 When 7 ℔. of Tobacco cost 5 *s.* 9 *d.* $\frac{1}{2}$, what will 30 C. weight cost? *Facit* 139 *l.*

Quest. 7. When the Tun of Wine cost 51 *l.* 14 *s.* what cost the Quart at that rate? *Facit* 12 *d.* $\frac{1}{4}$.

Quest. 8. At a Noble *per* Week, how many Months Board may I demand for 50 *l*? *Facit* 22 Months and 2 Weeks.

Quest. 9. A Grocer bought 30 Frails of Raisins, each Frail weighing 91 ℔. weight, at 18 *s.* 8 *d.* *per* C. I demand how much they amount to? *Facit* 22 *l.* 15 *s.*

Quest.

Quest. 10. What comes the Commission of 642 *l.* *s.* 09 *d.* to at 3 ½ *per cent. facit* 22 *l.* 9 *s.* 9 *d.*

Quest. 11. What comes the Insurance of 375 *l.* . 4 *d.* to at 3 Guinea's *per Cent.* the Guinea's at *s.* 9 *d.* ⅝? *facit* 12 *l.* 5 *s.* 6 *d.*

Quest. 12. A Corn Factor bought 248 Quarters Wheat for 511 *l.* 06 *s.* 8 *d.* for an 100 Quarters which he gave 33 *s.* 04 *d. per* Quarter, I demand how much he gave *per* quarter for the Remainder? *facit* 2 *l.* 6 *s.* 6 *d.*

Quest. 13. If a Piece of Cloath cost 21 *l.* 5 *s.* I demand how many Yards were in the same, the Yard being valued at 12 *s.* 6 *d*? *facit* 34 Yards.

Quest. 14. If a Piece of Cloth cost 24 *l.* 5 *s.* 4 *d.* demand how many Yards were contained in the me, when the Ell *English* is worth 17 *s.* 4 *d*? *acit* 35 Yards.

Quest. 15. Bought 124 Pieces of Camblet for the um of 987 *l.* 14 *s.* 8 *d.* at 4 *s.* 8 *d. per* Yard, I emand how many Yards there were in all, and ow many Ells *Flemish* there were in a Piece? *facit* 233 Yards, and 45 ½ Ells *Flemish per* Piece.

Quest. 16. A Gentleman hath an Estate of 1224 *l.* *er Annum*, and his Expences one day with another mount to 1 *l.* 13 *s.* 4 *d.* I demand how much he ayeth up at the Years end to purchase with? *facit* 515 *l.* 13 *s.* 4 *d.*

Quest. 17. A Gentleman expendeth one day with nother 43 *s.* 6 *d.* ½. and at the Years end layeth up 850 *l.* I demand his Annual Estate? *facit* 1644 *l.* 2 *s.* 8 *d.* ½ *per Annum.*

Quest. 18. Bought 3 Hogsheads of Nutmegs, bt. *viz.* at 5 *s.* 7 *d.* the Ounce, I demand the Neat cost thereof?

	C.	qr.	lb.
N° 1	3	2	21
2	4	1	14
3	4	2	18
	12	2	25

4
—
50
28
—
405
102
—
1425
16
—
8550
1425
—
22800 at *5 s. 7 d. Fa.* 6365 *l.*

Quest. 19. A Merchant consigns to his Fact[or] in *Spain* 188 Cloths, with Commission for Sale [at] 23 *l.* 2 *s.* 2 *d. per* Cloth, and to make return[s] from thence, the one half in Wines at 28 *l. p[er]* *Tun*, and the other half in Sugar at 27 *s. per* [C.] *Weight*, I demand how much of each ought to [be] returned for the Cloths?

Answer, the whole Value of the Cloth is 4344 [l.] 7 *s.* 4 *d.* the half whereof is 2172 *l.* 2 *s.* 8 [d.] which will buy 77 $\frac{3884}{6720}$ Tuns of Wine at 28 *l. p[er]* *Tun*, and the other half will buy 1609 $\frac{8}{324}$ Hundre[d] Weight of Sugar.

Quest.

Quest. 20. If 100 *l.* in 12 Months gain 6 *l.* Ineſt, what will be the Intereſt of 896 *l.* for the ne time, *facit* 53 *l.* 15 *s.* 2 *d.* $\frac{40}{00}$.

Quest. 21. An Uſurer putteth out 880 *l.* to Inreſt, and at the end of 12 Months he receives for incipal and Intereſt 932 *l.* 16 *s.* I demand at hat rate *per Cent. per Annum* he received Intereſt? *cit* 6 *per Cent.*

Quest. 22. I demand what Principle in 12 Months ill gain 64 *l.* 10 *s.* at the Rate of 6 *per Cent.* *acit* 1075 *l.*

Quest. 23. An Orphan is indebted to his Guarian 51 *l.* and the Guardian having in his hands 00 *l.* of the Orphan's, it is agreed between them, hat the Guardian ſhall keep the ſame in his hands ill the ſaid 51 *l.* be paid by the Intereſt thereof at *per Cent. per Annum.* Now I demand how long e ought to keep the ſame at that Rate? *facit* 8 Years and 6 Months.

Gain and Loſs.

Quest. 24. A Draper buys 2795 $\frac{1}{2}$ Ell *Flem.* of Ghenting, at 22 *d.* $\frac{1}{2}$ the Ell *Engliſh.* It is required to know at what Price the Cloth muſt be ſold out to gain 15 *l.* 10 *s. per Cent.* Firſt find the Price it coſt by the Rule of Three, *facit* 157 *l.* 4 *s.* 11 *d.* Then ſay, if a 100 *l.* give 15 *l.* 10 *s.* what will 157 *l.* 4 *s.* 11 *d. facit* 24 : 7 : 5. which added to 157 : 4 : 11 makes 181 : 12 : 4. Or if 100 lb. give 115 : 0 : what will 157 : 4 : 11. *Fa.* 181 : 12 : 4. which is anſwered at one Operation.

Loſs and Gain.

Quest. 25. If the aforeſaid Cloth were to be ſold ſo as to loſe 15 *l.* 10 *s. per Cent.* Firſt ſubtract

tract 15 *l.* 10 *s.* out of 100 *l.* *facit* 84 *l.* 10 Then say, If 100 *l.* fall to 84 *l.* 10 *s.* what 157 *l.* 4 *s.* 11 *d.* *facit* 132 *l.* 17 *s.* 6 *d.*

Fellowship.

Quest. 26. Three Merchants Company; *A*'s Stock was 175 *l.* 12 *s.* *B*'s 214 *l.* 19 *s.* 4 *d.* 150 *l.* 11 *s.* 9 *d.* they have gained together 209 11 *s.* 4 *d.* I demand each Man's part of *the* Gain? *First add the several Stocks into one Total* which makes 541 *l.* 3 *s.* 1 *d.* then make three several Questions in the Rule of Three, *viz.*

	l.	*s.*	*d.*		*l.*	*s.*	*d.*		*l.*	*s.*	*d.*
If	541	3	1	give	209	11	4	what	175	12	00
If	541	3	1	give	209	11	4	what	214	19	4
If	541	4	1	give	209	11	4	what	150	11	9

facit

Add all these *facits* together, if it make up the *Money* to be divided, your *Sum* is true. If you have any remains on the Divisions add them into one Total, which divide by the common Divisor, and the Quotient add to the lowest Denomination.

Fellowship with Time.

Quest. 27. Three Merchants Company. *A* his Stock was 109 *l.* 5 *s.* for 3 Months. *B* 450 *l.* 7 *s.* for 4 Months. *C* 147 *l.* 12 *s.* for 6 Months they have gained 209 *l.* 7 *s.* 2 *d.* I demand each Man's part.

Thi

This is worked as the last precedent Question, ly each Man's Stock is multiplied by the time, z.

109—05	B 450 — 7	C 147 — 12
3 *mo.*	4 *mo.*	6 *mo.*
327—15	B 1801 — 8	C 885 — 12
1801—08		
885—12		

		l. s. d.		*l. s.*	
f 3014 : 15	gain	209 : 7 : 2	what will	327 : 15	A
f 3014 : 15	gain	209 : 7 : 2	what will	1801 : 08	B
f 3014 : 15	gain	209 : 7 : 2	what will	885 : 12	C
				facit.	

Add all the *facits* together, if it make the given Sum 209 *l.* 7 *s.* 2 *d.* your Work is true, otherwise false.

The Proof of the Single Rule of Three Direct.

To prove a Question in the *Single Rule of Three Direct*, Multiply the fourth Number (or Answer to the Question) by the *first*, and if the Product thereof be equal to the Product of the *second* and *third*, then is the Operation truly performed, otherwise not; as in the first Example of this Chapter, *viz.*

If 18 Yards cost 72 Shillings, what will 596 Yards cost at that rate? The Answer there found is 28608 Pence, which is the fourth Number. Now the Product of the first and fourth, *viz.* 28608 by 18 is 514944, which is equal to the Product

Product the second and third, *viz.* 864 by 596 you may see by the following Operation, where the second Number, *viz.* 72 Shillings is reduced into 864 Pence.

yrds.	*d.*	*yrds.*	*d.*
18 ——	864 ——	596 ——	2866

$$\begin{array}{r} 864 \\ 596 \\ \hline 5184 \\ 7776 \\ 4320 \\ \hline 514944 \end{array} \qquad \begin{array}{r} \\ \\ \hline 22888 \\ 28600 \\ \hline 51499 \end{array}$$

And here Note, that if any thing remain after Division is ended, it must be added to the Product of the *first* and *fourth* Numbers, and then must that Sum be equal to the Product of the *second* and *third*. As in the third Example of this Chapter, which is, If 1 *C.* Weight of Tobacco cost 4 *l.* 5*s.* 2 *d.* what will 34 *C.* 3 *qrs.* 18 ℔. cost.

The 3 given Numbers being reduced, are 112 ℔. 1022 *d.* and 3910 *l.* and the fourth Number or Answer to the Question is there found to be 35678 *d.* and the Remainder is 84, the Product of the second and third is 3996020, and the Product of the first and fourth is 3995936, to which adding the remainder, the Sum is 3996020, equal to the Product of the *second* and *third*, which proves the Work to be true.

l.	d.	l.	d.
112	1022	3910	35678
		1022	112
		7820	71356
		7820	35678
		39100	35678
		3996020	3995936
		remains	add 84
			3996020

CHAP. VIII.

The Single Rule of Three Inverse.

THE *Single Rule of Three Inverse,* is when the fourth Number, or Number ſought, ught to bear ſuch proportion to the firſt, as the cond doth to the third.

II. When a Queſtion in the Single Rule of hree is ſtated, conſider whether the fourth umber (or Anſwer to the Queſtion) ought to e more or leſs than the ſecond Number, which pon a little Conſideration you may diſcover. If t ought to be more than the ſecond, then muſt he leſſer extream be the Diviſor, and if it ought o be leſſer then the ſecond, then muſt the biggeſt of the extreams be the Diviſor, (in this Caſe he firſt and third Numbers are called extreams) nd if it fall out that the third Number is the Diviſor, that Queſtion is ſaid to be of *The Single Rule*

Rule of Three Inverse. As in the following [Ex]amples.

Example I.

If 30 Men can build a Wall in 32 Days, I dem[and] in how many days 60 Men may do the same?

The given Numbers being ranked according [to] the sixth Rule of the seventh Chapter, will stand [as] followeth.

Men		Days		Men
30	——	32	——	60

Then I consider whether 60 Men will do it [in] more or less days than 32, and find that they w[ill] require less time than 32 days, (for the more t[he] Men the lesser the time) wherefore 60, which [is] the biggest extream, must be the Divisor, and t[he] first and third must be multiplied together, a[nd] their Product, which is 960, being divided by t[he] third Number 60, the Quotient is 16 days, and [in] so long time will 60 Men finish the said Wor[k]. See the following Operation.

Men		Days		Men
30	——	32	——	60
		30		
		6|0) 96|0		
		facit 16 *Days*		

Exampl[e]

Example II.

If 100 l. *in* 12 *Months gain* 10 l. *for the Interest ereof, I demand what Principal will gain the same terest in* 8 *Months?*

Here it being required what Principal will gain l. in 8 Months, therefore must 100 *l.* Principal the second Number, according to the Directions the Sixth Rule in the seventh Chapter, and the umbers being ranked accordingly, will stand thus:

Mon. *l.* *Mon.*
12 ——— 100 ——— 8 ?

Here I consider, that the shorter the time, the ore must be the Principal to gain the same Inte- st; wherefore the lesser extream must be the Di- sor, which here is (8) the third Number, there- re the first and second, *viz.* 12 and 100 must be ultiplied the one by the other, and the Product is 200, which being divided by (8) the third Num- er, the Quotient is 150 *l.* and so much will gain *l.* Interest in 8 Months at 10 *l.* *per Cent. per nnum*: See the following Work.

12 ——— 100 ——— 8
12

8) 1200

facit 150

Example III.

Lent my Friend 120 l. *for 6 Months, he promising to do me the like Courtesie another time; and not long after I had occasion for a Sum of Money for 9 Months, I demand how much he ought to lend me for that time to retaliate my former Kindneß.*

Facit 80 *l.* The longer the time, the leſſer ought the Sum of Money to be.

Example IV.

A Footman performs a Journey in 12 *days, when the day is* 15 *hours Long, I demand in how many days he may perform the ſame when the day is* 10 *hours long?*

Facit 18 days. The ſhorter the days, the more days will the Journey require.

Example V.

How many Yards of Matting that is half Yard wide is enough to cover a Flore that is 16 *Foot wide, and* 28 *Foot long?*

Facit 298 $\frac{2}{3}$ Yards of Matting.

Example VI.

Suppoſe that (according to the Statute) when the Buſhel of Wheat coſt 4 s. *the Penny-Loaf ought to weigh None Ounces, I demand what the Price of the Buſhel ought to be, when the Penny-Loaf weigheth* 12 *Ounces? Facit* 3 s. per Buſhel.

Examp

Example VII.

If when the Tun of Wine coſt 45 l. *a certain quanti- worth* 25 s. *is ſufficient for the Accommodation of* ꝺ *Men, I demand how many Men the ſame* 25 s. *orth will ſuffice when the Tun is worth* 30 l.
Facit 30 Men, for the cheaper the Wine, the more ay be bought for the ſame Money.

Example VIII.

If when the Tun of Wine coſt 45 l. *a quantity worth* ꝺ s. *is enough for the Entertainment of* 40 *Men, I de- and the Price of the Tun when* 50 s. *worth is enough* r 90 *Men? Facit* 20 l. *per* Tun.

Example IX.

If 60 *Ells at* London *be equal to* 100 *Ells at* Ant- erp, *and each Ell at* London *remains* 20 *Nails of English Yard, I demand how many ſuch Nails the* l *of* Antwerp *contains? Facit* 12.

Example X.

If for 5 l. 3 s. 4 d. *I can have* 10 C. *weight car- d* 140 Miles, *I demand how many Miles I may have* C. *weight carried for the ſame Money?*
Facit 100 Miles.

The Proof of the Single Rule of Three Inverſe.
If the Product of the fourth Term multiplied by e Third, be equal to the Product of the Second ltiplied by the Firſt, then is the Work truly rformed, otherwiſe not.

Let us prove the first Example of this Chapter, viz. *If 30 Men can build a wall in 32 days, I demand in how many Days 60 Men may do the same.* The Answer is there found to be 16 days, and the four Terms being duly ranked, stand as followeth.

Men	*days*	*Men*	*days*
30	32	60	16
30			60
960			960

The fourth Term (16) being multiplied by (60) the third Term, is 960, which is equal to the Product of (32) the second Term, by (30) the first.

CHAP. IX.

The Double Rule of Three Direct.

I. THE *Double Rule of Three*, is when there are Five Numbers given to find out a Sixth in proportion thereunto.

II. A Question in the *Double Rule of Three* may be resolved by Two Single Rules of Three, or by *One Rule of Three composed of the five given Numbers.*

III. When a Question in the *Double Rule of Three* may be solved by two Single Rules of Three Direct, that Question is said to belong to the Double Rule of Three Direct.

IV.

IV. Of the five Numbers given in the *Double Rule of Three*, three of them always imply a Suppofition, and the other two a Demand. As in the following Example.

If 16 Men can reap 96 Acres of Wheat in 36 days, I demand how many Acres 64 Men may reap in 48 days?

Here the Suppofition is, *If, or Suppose, 16 Men reap 96 Acres in 36 days*; and the Demand is, *How many Acres 64 Men may reap in 48 days?*

V. When you would folve a Queftion in the *Double Rule of Three*, the given Numbers are to be fo ranked, that the Firft and Third may be of one Denomination, and the Second Number muft be of the fame Quality, Name, or Denomination with the Number fought; and note, That the Firft and Second Numbers muft be always of the Suppofition, and the Third of the Demand. So likewife muft the Fourth Number be of the Suppofition, and the Fifth of the Demand, and both of one Denomination; fo may each Queftion be folved by Two fingle Rules of Three, two different ways. As in the Queftion foregoing, which being again repeated is as followeth.

If 16 Men can reap 96 Acres of Wheat in 36 days. How many Acres may 64 Men reap in 48 days? The Numbers being ranked according to the foregoing Directions, will ftand as followeth.

Men	*Acres*	*Men*
16 ——	—— 96 ——	—— 64
days 36 ——	————	—— 48 *days*

Or thus,

Days	*Acres*	*Men*
36 ——	—— 96 ——	—— 48
Men 16 ——	————	—— 64 *Men.*

 VI.

VI. When a Queſtion in the *Double Rule of Th* is to be ſolved at two ſeveral Operations in t Single Rule of Three, the Anſwer to the firſt Qu ſtion muſt be the ſecond Number in the ſeco Queſtion, and the fourth and fifth Numbers muſt the firſt and third in the ſecond Queſtion.

So in the firſt order of ranking the given Num bers in the foregoing Queſtion, the three firſt Nu bers are 16—96—64, wherein is implied this Qu ſtion, *viz. If 16 Men can reap 96 Acres, How mu may 64 reap in the ſame time, viz.* in 36 Days? Mul ply and divide according to the Directions given the Seventh Rule of the Seventh Chapter, and y will find the Anſwer to be 384 Acres; ſo that no I have found how many Acres 64 Men may reap 36 days, but by the Queſtion it is required to kno how much they can reap in 48 days.

Therefore I ſay again by the Single Rule of Thre *If 36 days will reap 384 Acres, How many may done in 48 days?* Multiply and Divide, and you w find the Anſwer to the Queſtion to be 512 Acr and ſo many may 64 Men reap in 48 days, if Men can reap 96 Acres in 36 days. See the who Work as followeth.

M

Men *Acres* *Men*
16 ——— 96 ——— 64
days 36 ——— ——— 48 *days*

16 — 96 — 64
96
——
384
576
——
16) 6144
—— 134
facit 384 *Acr.* 64
——
0

Days *Acres* *Days*
36 —— 384 —— 48
384
——
3072
1536
——
36) 18432
—— 43
facit 512 *Acr.* 72
——
0

In the second stating of the above Work, I multiply 384 by 48 to save Paper, for if the two Numbers be multiplied together, it is indifferent whether the Multiplicand or Multiplier be placed uppermost.

Or if the Five given Numbers of the foregoing Question had been ranked according to the Second Method laid down at the latter end of the Fifth Rule, the Answer would have been the same, and the Operation as followeth.

```
Days          Acres          Days
 36 ——————————— 96 ——————————— 48
Men 16 ——————————————————————— 64
36 —— 96 —— 48 | 16 —— 128 ——
            96 |
         ----- |
           288 |               ----
           432 |               7..
         ----- |               ----
      36) 4608 |          16) 8..
           100 |
facit 128 Acr. 288 |   facit 512 Acr.
         ----- |
             0 |
```

I doubt not, but that by the Operation before going, this Rule is sufficiently illustrated; but for the Learners further Experience herein, I shall propound several other Examples, and only give the Answers, leaving the Operations to the Industrious Learner.

Example 2. *I demand the Interest of* 75 l. *for* 18 *Months, after the rate of* 6 per Cent. per Annum.

This Question may be more intelligibly stated thus, *viz.* *If* 100 l. *in* 12 *Months gain* 6 l. *Interest, What will* 75 l. *gain in* 18 *Months at that rate?* *facit* 6 l. 15 s.

Example 3. *If* 12 *Men can reap* 48 *Acres of Wheat in* 18 *days, I demand how many Acres* 36 *Men may reap in* 24 *days?* *facit* 192 Acres.

Example 4. *If* 3 *Quarters of Malt is sufficient for a Family of Six Persons for two Months. How many Quarters is enough for a Family of* 18 *Persons for* 12 *Months?* *facit* 54 Quarters.

Example

Example 5. *If* 8 *Reapers have* 3 l. 4 s. *for* 4 *days Work, I demand how much* 24 *Men will have for* 16 *days Work? facit* 38 l. 8 s.

Example 6. *If* 336 ℔. *of Bread is sufficient for* 56 *Men for* 12 *days, I demand how much will serve* 460 *Men* 96 *days? facit* 22080 ℔. of Bread.

Example 7. *If* 40 *Bushels of Oats be enough for* 8 *Horses* 20 Days, *I demand how many Bushels will serve* 48 *Horses* 12 *days? facit* 144 Bushels.

Example 8. *A Banker took in* 250 l. *to pay Interest for the same, and at the end of* 18 *Months he paid* 272 l. 2 s. *for Principal and Interest, I demand at what Rate* per Cent. per Annum, *he paid Interest?*

CHAP. X.

The Double Rule of Three Inverse.

I. WHEN a Question in the Double Rule of Three being solved at two Single Rules, as is taught in the foregoing Chapter, hath one of those Single Rules Inverse, (for they are never both Inverse) Then is that Question said to be of the *Double Rule of Three Inverse.*

II. A Question in the Double Rule of Three Inverse, may be stated two several ways, as well as a Question in the Double Rule Direct, and so the Inverted Proportion may be either in the first or second Operation at pleasure.

Example 1. *If a Footman Travel* 240 *Miles in* 8 *days, when the day is* 10 *hours long, I demand in how many days he may Travel* 720 *Miles, when the day is* 15 *hours long?*

The given Numbers being ranked according [...] the fifth Rule of the ninth Chapter, will stand [...] followeth:

	Miles	*Days*	*Miles*	
	240 ——	8 ——	720	
Hours	10 ——	——	15	*Hours*

Or thus,

	Hours	*Days*	*Hours*	
	10 ——	8 ——	15	
Miles	242 ——	——	720	*Miles*

Here according to the first manner of ranking the given Terms, the Inverted Proportion is in the second single Operation.

III. You may also work the Double Rule of Three either *Direct* or *Inverse* at one Operation, by the *Compound Rule of five Numbers*, observing to rank the several Terms as is before taught in the fifth Rule of the Ninth Chapter.

IV. And if your Question be of the Double Rule of Three Direct, Multiply the three last Terms together for Dividend, and the two first for Divisor, as in the following Examples, *viz.*

If 100 l. *in* 12 *Months require* 6 l. *Interest, How much Interest will* 50 *l. require in* 10 *Months.*

```
l.        mo.        l.          l.
100 ------ 12 ------ 6           50
 10 ------ 10                    10 m.
                              --------
                     100         500
                      12           6
                  --------    --------
facit 2 l. 10 s.  12|00.       30|00
                              --------
                                2|10
```

V. But if your Question be of the *Rule of Three Inverse*, Multiply the first, second, and last Numbers together for Dividend, and the third and fourth for Divisor, as in the following Example.

Example. *If* 50 l. *in* 10 *Months require* 2 l. 10 s. *Interest, Of what Principal shall the Interest of* 6 l. *make in* 12 *Months?*

```
   l.          mo.        l.       s.
If 50 -------- 10 ------- 2 ------ 10
               12 ------- 6                 50
                                            10
                       l.      s.        ------
                       2 ---- 10           500
facit 110 l.                  12             6
                       ----------        ------
                            3|0)         300|0
                       ----------        ------
                           facit         100—
```

This last being a Question in the Rule of Three Inverse, according to the Directions given in the Fifth Rule of this Chapter, I multiply the first, second,

second, and last-Numbers together for Dividen which produces 3000. Then I multiply 2 *l.* 10 my third Number by 12, my fourth Number, an say, 12 times 10 *s.* is 120 *l.* I put down a (o) an carry 6 *l.* to the place of Pounds, and say, 12 tim 2 is 24 and 6 I carried is 30 for my Divisor. The I divide and the Quotient is 100 *l.* being the Pri cipal that 6 *l.* Interest will make in 12 Month which was to be proved.

But a more particular Application shall be mad of the Double Rule of Three, when we come t treat of Simple Interest.

CHAP. XI.

Of Exchange.

HAving Explained the Nature of the Rule o Three, and the manner of Resolving Question therein, I am naturally led to treat of its particula Use in the EXCHANGE of Coyns.

In the Exchange of Coyns, it is necessary tha the *Par* or *Value* of the *Mony* in each place be ex actly known. For the Word *Par* signifies to Equa lize the Mony of Exchange from one *Place* with that of *another Place.* As when I take up so much *Mony* per Exchange in one *Place*, to *pay* the just *value* thereof in *another* kind of *Mony* in another *Place*, without having Respect to the price Current of Exchange for the same, but only to what the Mony does currantly pass for in each place. From whence may be easily found out the *Profit* and *Loss* of all *Monys* Drawn or Remitted by *Exchange.*

But

But this *Par* being grounded principally upon the *Currant Value* of Coyn, the Plenty and Scarcity thereof, the Rising and Falling, Inhansment and Debasing of the same, it must necessarily follow, that the Value of Coyn is Subject unto Change. An Example whereof you have in *France*, where their Coyn has been Changed, Inhanced and Lowred for several times in a few Years; and in this present year 1702. the French Crown which was 60 Sous or 3 Livers, is now raised to 75 Sous or 3 Livers 15 Souls.

The Denominations in which *England*, and the following Places Exchange each with other are, *viz.*

The Exchange of Monies *from London* to Antwerp, Amsterdam, Hambrough, Lisle, Midleborough and other parts of Flanders and Holland, is *Valued on the Pound Sterling* of 20 Shillings. That is to *pay* after the rate of so many Shillings, and Pence *Flemish* for every Pound Sterling.

The Exchange from *London* to Paris, Roan and most parts of France is *Valued* on the *French Crown* at 54 *d.* that is to *pay* so many *Pence*, or so many *Shillings* and *Pence Sterling*, for the French Crown.

The Exchange from *London* to Venice is *made* on the *Duccat* at 52 *d.* Sterling, to pay so many *Pence* and parts of a *Penny Sterling* for every Duccat.

The Exchange from *London* to Leghorn, Genoa, Cales, Madrid, and other parts of *Spain*, is *made* on the *Dollar* or *Piece of Eight*, at 54 Pence Sterling, that is to pay so many *Pence* on parts of a Penny *Sterling* for every Dollar.

The

The PAR at Antwerp, Amſterdam, Hambrough, Liſle, Midleborough and other Parts of Flanders with our Pound Sterling, is *thirty three Shillings* 4 Pence Flem. for a *Pound Sterling*, which 33 Shillings 4 d. do make 10 Guilders at 2 Shillings Sterling the Guilder, or 10 Livers Tournois.

The PAR at Paris, Roan, and other Parts of *France* has been reckoned ſome times at 71 Sous the Crown of 3 Livers, Tournoys, generally at 66 Sous the Crown of 3 Livers, Every Liver valued at 1 Shilling 6 Pence Sterling, the Crown valued at 4 *s.* 6 *d.* Sterling.

The PAR at Leghorn, Madrid, Cales, Genoa, is at 54 *Pence Sterling* for the Dollor or Piece of Eight.

The PAR at Venice with our *Sterling Mony* is at 6 Livers 4 Sous of Venice per Duccat, or 51 Pence Sterling, ſometimes 52 Pence.

The Hambrough PAR is ſometimes reckoned at *Four* Ricks Dollars and a half, which makes 32 Shillings *Flemiſh* for 20 Shillings Sterling.

The PAR at Liſbon is at 6 *s.* 8 *d.* ½ Sterling on the Milrea or 1000 Reas.

The PAR at Oporto is the ſame as that at Liſbon.

The

The Value of the most usual Coyns with which England *does chiefly Exchange are,* viz.

		Sterling Mony s.	d.
Holland & Flanders.	1 Stiver is	0	: $1\frac{1}{5}$
	6 Stivers of 1 Shilling Flemish is	0	: $7\frac{1}{5}$
	20 Stivers is 1 Guilder or	2	: 0
	6 Guilders a Pound Flem. of 20 *s.* is	12	: 0
	33 Shillings 4 *d.* Flemish is	20	: 0
	1 Zeland common Dollar is	3	: 0
	1 Duccatoon	6	: 0
	1 Specie Dollar	5	: 0

		s.	d. q.
France.	12 Dencers or 1 Soulz is	0	: 0 $3\frac{1}{5}$
	20 Soulz or 1 Liver is	1	: 6
	3 Livers or 1 French Crown	4	: 6

		Sterling Mony s.	d.
Spain.	a Mervid is about $\frac{1}{8}$ and $\frac{1}{4}$ of $\frac{1}{8}$ *d.*	0	: 0 $\frac{5}{37}$
	34 Mervedes is a Rial or about	0	: $4\frac{3}{4}$
	11 Rials plate is 1 Duccat or	4	: $4\frac{1}{4}$
	10 Rials plate 1 piece of Eight or	4	: 0
	1 Rial *Copper* (is called) *Vellon* or	0	: $3\frac{1}{8}$
	15 Rials *Copper* 1 Ps. of eight is about	4	: 0

☞ Note, *the Rial was formerly valued at* 6 *pence Sterling or very near it, and then* 8 *Rials was* 1 *Piece of* $\frac{8}{8}$, *but the Mony is of late years altered.*

		Sterling Mony s.	d.
Portugal.	$12\frac{1}{2}$ Reas of *Portugal*	0	: 1
	1 Mil Rea or 1000 Reas	6	: 8
	1 Festoon is	1	: 3

1 Liver

		Sterling mon[ey] s.	d.
Italy.	1 Liver at *Leghorn* is	0	9
	1 Crown Currant at *Florence* is	5	3
	1 *Duccat de Banco* at *Venice* is	4	4
	1 St. Mark	2	10
	1 Palarmo Florin is	2	6
Germany.	1 Rix Dollar of the Empire	4	5 $\frac{11}{44}$
	4 $\frac{1}{2}$ Rix Dollars makes 32 flem. at *Hambrough*, &c.	20	0
	1 Guilder of *Noremburg* is	7	1

A Merchant in London *remits to* Rotterdam 375 ll. 10 d. *Sterling, at* 34 s. 8. *Flemish for* 20 *Shillings Sterling, How many Guilders Flemish must be paid at* Roterdam, *and what is gained per Exchange.*

```
s.              s.  d.               li.  s.  d.
20 Ster.——————— 34 : 8 Flem. what   375 : 10 :
                12                   20
                ——                  ————
               416                  7510
                                     416
                                   —————
                                   45060
                                   7510
                                  30040
                                 ———————
Guilders : Stiver              2|0) 312416|0
fa. 3905 : 4                   ——————————————
                                  2) 15620|8
                                 ————————————
                                 2|0) 7810|4
                                 ————————————
                                       3905
```

To

To find the *Gain* or *Loss* in one Pound, Subtract 3 *s.* 4 *d.* out of 34 *s.* 8 *d.* the Course of Exchange, the difference is 1 *s.* 4 *d.* Flem. *per* Pound, and so much Gain is the Course of Exchange in our Favour.

If the Course of the Exchange be under Par, it must by Parity of Reason become a *Loss* to us, and then the Course of Exchange is to our Prejudice.

The like is to be observed for the Coyns Exchanged in all other Countries.

I will give but one Example of *Loss* by Exchange, by which, with the foregoing Example of *Gain*, the ingenious may with ease travel through the General Course of Exchange with all Countries.

A Merchant in *London* remits a Bill of Exchange to *Amsterdam* for 297 *l.* 15 *s.* Sterling, at 31 *s.* 3 *d.* *Flem.* for 20 *s.* Sterling, I demand how much *Flemish* Money was paid for the said Bill in *Amsterdam*, and what is lost *per* Pound by the Exchange.

s.	*s.*		*d.*		*l.*		*s.*	
20	31	:	3	*Flem.*	297	:	15	*Sterling.*

Guild. *Shill.*
Answer 2791 : 8 paid, and 2 *s.* 1 *d.* *Flem. per* Pound lost by the Exchange.

PRA-

PRACTICAL TABLE.

s. d.	l.	d.	s.	lb.	C. wt.
10—0—	$\frac{1}{2}$	6—	$\frac{1}{2}$	56—	$\frac{1}{2}$
6—8—	$\frac{1}{3}$	4—	$\frac{1}{3}$	84—	$\frac{3}{4}$
5—0—	$\frac{1}{4}$	3—	$\frac{1}{4}$	28—	$\frac{1}{4}$
4—0—	$\frac{1}{5}$	$1\frac{1}{2}$—	$\frac{1}{8}$	14—	$\frac{1}{8}$
3—4—	$\frac{1}{6}$	1—	$\frac{1}{12}$	16—	$\frac{1}{7}$
2—6—	$\frac{1}{8}$			8—	$\frac{1}{12}$
2—0—	$\frac{1}{10}$			7—	$\frac{1}{16}$
1—8—	$\frac{1}{12}$				

I. *When the given Price is Pence, take your paur in Shillings,* the Product divide by 20, gives th Anſwer in Pounds.

O R, you may bring it into Pounds, at once, b cutting off the laſt Figure, and by conſidering tha 240 Pence is one Pound, whereof 8 *d.* is $\frac{1}{30}$. 6 is $\frac{1}{40}$ 4 *d.* is $\frac{1}{60}$ 3 *d.* is $\frac{1}{80}$ 2 *d.* is $\frac{1}{120}$.

Example I.

254 lb. of Tobac-(co at 1 *d.*

d. 1 $\frac{1}{12}$ | 2|1 : *d.*

l. 1 : 1 2 *facit.*

254 lb. at 2 *d.*

d. 2 $\frac{1}{6}$ | 4|2 : 4

l. 2 : 2 : 4 *facit.*

716 Ells at 3 *d.*

d. $3\frac{1}{80}$ | s. d.

l. 8 : 19 : 0 *facit.*

215 lb. at 4 *d.*

d. $4\frac{1}{60}$ | s. d.

l. 3 : 11 : 8 *facit.*

643 *Gall.* at 6 *d.*

d. $6\frac{1}{40}$ | *l.* 16 : 1 : 6 *facit.*

The

The three laſt Examples are brought into Pounds one Operation, after which manner any Sum in actice may be readily caſt up.

Here you ſee that 254 lb. of Tobacco at 1 *d.* a ound, divided by the $\frac{1}{12}$ gives 21 *s.* 2 *d.* and that vided by 20 (by cutting off the laſt Figures and king $\frac{1}{2}$ of it) gives 1 *l.* 1 *s.* 2 *d.* the Price of 54 lb. of Tobacco; and for 2 *d.* a lb. take the $\frac{1}{6}$, ecauſe 2 *d.* is the $\frac{1}{6}$ part of a Shilling, and for 3 *d.* lb. take $\frac{1}{4}$; and ſo for the others at 4 *d.* and 6 *d.*

II. *When the given Price are ſuch Pence as are no ven part of a Shilling* take firſt the greateſt even art of a Shilling, and then part of that part; add hem together, and divide the Product by 20, or ut off the laſt Figure and take $\frac{1}{2}$.

d.		2121 Ells at 5 *d.*
4	$\frac{1}{3}$	707
1	$\frac{1}{4}$	176 : 9 *d.*
5		88|3 : 9
		44 : 3 : 9 *facit.*

		784 lb. at 7 *d.*
6	$\frac{1}{2}$	392
1	$\frac{1}{6}$	65 : 4 *d.*
7		45|7 : 4 *d.*
		22 : 17 : 4 *facit.*

254 lb. of Tobacco at 9 *d.* and 10 *d.* $\frac{3}{4}$ a

		254
6	$\frac{1}{2}$	127
3	$\frac{1}{2}$	63 : 6
9		19|0 : 6
	$\frac{1}{4}$	9 : 10 : 6 *fa.*

d.		254 at 10 *d.* $\frac{3}{4}$.
6	$\frac{1}{2}$	127 shill. in 254 six pe[...]
4	$\frac{1}{3}$	84—8 in 254 groats[...]
$\frac{1}{2}$	$\frac{1}{8}$	10—7 in 254 half pen[...]
$\frac{1}{4}$	$\frac{1}{2}$	5—3 $\frac{1}{2}$ in 254 farthin[...]
		22|7 : 6 $\frac{1}{2}$
		11|7 : 6 $\frac{1}{2}$ *facit.*

Demonstration. In 254 lb. of Tobacco at 10 *d.* [...] a lb. there must be 254 sixpences, which is [...] Shillings and 254 Groats, which is 84 *s.* 8 *d.* a[nd] 254 Half-pence, which is 10 *s.* 7 *d.* and 254 F[ar]things, which is 5 *s.* 3 *d* $\frac{1}{2}$, all these added tog[e]ther, make 227 *s.* 6 *d.* $\frac{1}{2}$, which divided by 20, give[s] the *facit*, 11 *l.* 7 *s.* 6 *d.* $\frac{1}{2}$.

		614 lb. at 11 *d.*
6	$\frac{1}{2}$	307
4	$\frac{1}{3}$	204 : 8 *d.*
1	$\frac{1}{4}$	51 : 2
11		56|2 : 10
		28|12 : 10 *facit.*

		563 lb. at 12 *d.* $\frac{1}{2}$
6	$\frac{1}{2}$	281 : 6 *d.*
4	$\frac{1}{3}$	187 : 8
1 $\frac{1}{2}$	$\frac{1}{4}$	70 : 4 $\frac{1}{2}$
		53|9 : 6 $\frac{1}{2}$
		26 : 19 : 6 $\frac{1}{2}$ *facit.*

III. *If the given Price be any Number of Pen[ce] above* 1 s. *and less than* 2 s. take the Aliquot part[s] in Pence, (as in the last precedent) to which ad[d] the given Quantity for the 1 *s.* and proceed as be[-]fore.

Exampl[e]

Example.

d. 3

	254 lb. at 15 *d.*
1/4	63 : 6
	31|7 : 6
	15 : 17 : 6 *facit.*

	254 at 17 *d.*
1/3	84 : 8
1/4	21 : 2
	35|9 : 10
	17 : 19 : 10 *facit.*

	264 *yds.* at 18 *d.*
1/2	132
	39|6
	19 : 16 : 0 *facit.*

	295 *gall.* at 19 *d.*
1/2	147 : 6
1/6	24 : 7
	46|7 : 1
	23 : 7 : 1 *facit.*

	672 lb. at 22 *d.* 3/4
1/2	336
1/3	224
1/8	42
	127|4
	63 : 14 : 0 *facit.*

	456 *Ells* at 23 *d.* 1/4
1/2	228
1/3	152
1/4	38
1/4	9 : 6
	88|3 :
	44 : 3 : 3 : 6

In

In 672 ℔. at 22 *d.* $\frac{3}{4}$ a ℔. I take $\frac{1}{2}$ for 6 *d.* $\frac{1}{3}$ for 4 *d.* and the $\frac{1}{8}$ for the $\frac{3}{4}$, because $\frac{3}{4}$ is th of 6 *d.* by which you will find that in 672 Sixp ces there is 336 Shillings, and in 672 Groats th is 224 Shillings, and in 672 three Farthings there 42 Shillings.

IV. *If the given Price be such Shillings as are even part of a Pound* Sterling, take such a Part the given quantity, and the Quotient is Pounds.

	Ells *s.* *d.* 434 at 1 : 8		*yds.* 271 at 2 *s.*
$\frac{1}{12}$	36 : 3 : 4 *facit.*	$\frac{1}{10}$	27 : 2 : 0 *facit*
	674 at 2 *s.* 6 *d.*		495 at 3 *s.* 4 *d.*
$\frac{1}{8}$	84 : 5 : 0 *facit.*	$\frac{1}{6}$	82 : 10 : 0 *facit*

	Crowns. 457 : at 5 *s.*		*Dollars.* 612 at 4 *s.*
$\frac{1}{4}$	114 : 5 : 0 *facit.*	$\frac{1}{5}$	122 : 8 : 0 *facit.*
	295 at 6 *s.* 8 *d.*		372 at 10 *s.*
$\frac{1}{3}$	98 : 6 : 8 *facit.*	$\frac{1}{2}$	186 : 0 : 0 *facit*

In this first Example of 434 Ells at 1 *s.* 8 *d.* I take the $\frac{1}{12}$ because 1 *s.* 8 *d.* is the $\frac{1}{12}$ of a *l.* and say, 12 in 43 is 3 times, rest 7, which makes the 4 to be 74; then 12 in 74, is 6 times, rest 2, which is 2 *l.* that I turn into Shillings, and say,

12

in 40 *s.* is 3 times, and there refts 4 *s.* which turn into Pence, and it makes 48 Pence; then in 48 is 4 times. And the *Facit* is 36 *l.* 3 *s.* *d.*

V. *If the given Price be fuch Shillings and Pence are no even parts of a Pound,* Multiply the given antity by the Number of Shillings, and take the iquot parts of Pence, and proceed according to e Second Rule of this Chapter.

Ells	*Ells*
375 at 8 *s.* 6 *d.*	493 at 15 *s.* 10 *d.*
8	15
3000	2465
½ 187 : 6	493
318|7 : 6	½ 246 : 6 *d.*
159 : 7 : 6 *facit.*	⅓ 164 : 4
	780|5 : 10
	390 : 5 : 10 *facit.*

C.

C. s. d.
295 at 12—9
12
———
½ 3540
½ 147 : 6
73 : 9
———
376|1 : 3
———
188 : 1 : 3 *facit.*

C. s. d.
214 at 7—11
7
———
1498
½ 107
½ 53 : 6
⅓ 35 : 8
———
169|4 : 2
———
84 : 14 : 2 *facit*

VI. *If your given Price be any Number of Pou*[nds,] *Shillings, and Pence.* Reduce first your Pounds a[nd] Shillings into Shillings, and proceed according [to] the last Rule.

Pieces *l.* *s.* *d.*
754 at 4—03—7
83 20
———
2262 83
6032
½ 377
⅙ 62 : 10
———
6302|1 : 10
———
3151 : 1 : 10 *facit.*

Tun. *l.* *s.* *d.*
176 at 3—07—11
67 20
———
1232 67
1056
———
11792
½ 88
⅓ 58 : 8
———
1193|8 : 8
———
596 : 18 : 8 *facit.*

V[II.]

VII. *If your given Price be any Number of Pounds, nd exceeding five Pound,* then Multiply your given uantity by the Number of the Pounds, and take our Aliquot part in Shillings and Pence, *viz.*

	C. l. s. d.
	74 at 11-12-6
	11
	814
½	37 d.
¼	9 : 5 : 0
l.	860 : 5 : 0 *facit.*

	hhead. l. s. d.
	394 at 16—16—8
	16
	2364
	394
½	197
½	98 : 10
¼	24 : 12 : 6
⅓	8 : 4 : 2
	6632 : 6 : 8 *facit.*

VIII. *If the given Quantity be any Number of C. s or* ℔. *or* Tun. C. qrs. *and* ℔. &c. work as before here no part is, and take your Aliquot parts in uarters and Pounds, or in *C. qrs.* ℔. and add em to your first Work. An Example or two will ake this plain.

	C.	s. d.
	75 $\frac{1}{2}$ at	22 : 6
	22	
		11 : 3
	150	
	150	
$\frac{1}{2}$	37 : 6	
	11 : 3	
	169|8 : 9	
	84 : 18 : 9 *facit.*	

	C.	s.	d.
	63 $\frac{3}{4}$ at	12 :	10
	12		
		6 :	5
	756	3 :	2
$\frac{1}{2}$	31 : 6		
$\frac{1}{3}$	21 : 0	9 :	7
	9 : 7 $\frac{1}{2}$		
	81|8 : 1 $\frac{1}{2}$ *facit.*		
	40 : 18 : 1 $\frac{1}{2}$ *facit.*		

In the Example of 63*C.* $\frac{3}{4}$ at 12 *s.* 10 *d.* *C. weight*, I multiply the *C.* by 12 *s.* and take parts in Pence for the odd Pence; then for th of a *C.* I first take the $\frac{1}{2}$ of the price of a *C.* that makes 6 *s.* 5 *d.* the price of $\frac{1}{2}$ a *C.* and I take the $\frac{1}{2}$ of that, which gives 3 *s.* 2 *d.* $\frac{1}{2}$, price of a qr. of a *C.* Add them together, it the price of $\frac{3}{4}$ of a *C.* which is 9 *s.* 7 *d.* $\frac{1}{2}$, must be added to your first Work. Two or th Examples more will make it familiar and eas any Capacity.

84 *C.* 3 *qrs.* 11 lb. at——21 *s.* 10 *d.*

	21	
	84	
	168	
$\frac{1}{2}$	42	
$\frac{1}{3}$	28	
	18 : 6	
	185|2 : 6	
	92 : 12 : 6 *facit.*	

$\frac{1}{2}$	10	11
lb. $\frac{1}{2}$	5	$5\frac{1}{2}$
$7\frac{1}{4}$	1	$4\frac{3}{4}$
$4\frac{1}{7}$	0	$9\frac{1}{4}$
	18	6

the price of 3 *qrs.* 11 lb.

Tun.	*C.*	*qr.*	lb.		*l.*	*s.*	*d.*	
12	14	3	14	at	15	17	06	*a Tun.*
							12	
					190	10	00	
				$\frac{1}{2}$	7	18	9	
				$\frac{1}{5}$	3	3	6	
				$\frac{1}{8}$	0	7	$11\frac{1}{4}$	
				$\frac{1}{2}$	0	3	$11\frac{1}{2}$	
				$\frac{1}{2}$	0	1	$11\frac{3}{4}$	
				Facit	202	06	$1\frac{1}{2}$	

CHAP. XIII.

The Order of Deducting TARE *a*[nd] TRET.

GROSS is the Weight of a Commodity, w[ith] the *Hogsheads, Chests, Box,* or whatever [...] contains it.

TARE is the Allowance given for the Wei[ght] of the Cask, Hogshead, &c.

TRET is an Allowance of 4 lb. in 104 lb. [for] waste and dust on some sort of Goods.

	C. qr. lb.	lb.
Ex. 11 *hhds.* qt.	45--3--15	*Groß Tare* 14 *per*
14—$\frac{1}{8}$		*how many* lb. *neat?*
	5--2--26	*Tare.*
Facit	40--0--17	*Neat.*

I. Here 14 lb. *Tare* being $\frac{1}{8}$ of 112 lb. take [...] the *Groß*, the Quotient gives the whole *Tare* w[hich] subtract from the *Gross*, gives the *Neat* weight.

The Operation is performed thus. Divide [the] *Gross* by 8, say, 8 in 45, 5 times, and 5 C[...] mains, which is 20 *qrs.* and 3 is 23; then 8 in [23] 2 times, 7 *qrs.* remains, which turned into Po[unds] by 28, and added to the 15 lb. makes 211 lb. [...] 8 in 211 is 26 times. So the *Tare* is 5 C. [2 qrs.] 26 lb.

Exa[...]

	C.	qr.	lb.		s.	d.
Example.	40 :	0 :	17	*Neat* at	22 :	6

22

80
80
20
3 : 4 $\frac{3}{4}$

90|3 : 4 $\frac{3}{4}$

45 : 3 : 4 $\frac{3}{4}$

lb.
14 $\frac{1}{8}$ — 2 : 9 : $\frac{3}{4}$
2 $\frac{1}{7}$ — 0 : 4 : $\frac{3}{4}$
1 $\frac{1}{2}$ — 0 : 2 : $\frac{1}{4}$

facit 3 : 2 : $\frac{3}{4}$ price of 17 lb.

If the *Tare* be 16 lb. in 112 lb. take $\frac{1}{7}$ of the *Gross*, and work as before.

If 18 lb. *per* 112 lb. for *Tare*, take the Aliquot parts, *viz.*

for 16 lb take the $\frac{1}{7}$ } Add the *Tare* of 16 and the
for 2 take the $\frac{1}{8}$ } *Tare* of 2 together; the total subtract from the Gross, and work as before.

lb. lb. lb.
If 20 in 112 for *Tare* { for 16 take $\frac{1}{7}$ lb.
for 4 take $\frac{1}{4}$ of 16

II. When an Allowance is made for *Tret*, then (after the *Tare* is subtracted from the *Gross*) the remainder is called *subtle*, which divided by 26, because 4 lb is the 26th part of 104 (the Allowance always given for *Tret*) the Quotient gives the *Tret*, which subtracted from the *subtle*, gives the *Neat* weight.

C. qr. lb.   lb.   lb.   lb.   lb.
Ex. 45 : 3—15 Gr: *Tare* 16 in 112 *Tret* 4 in 11
$16\frac{1}{7}$ 6 : 2 : 6 *Tare.*

39 : 1 : 9 *Subtle.*   4) 104
4   26.

157
28

1265
314   26) 4405
     180
4405 *pound subtle.*   169   245
169 *Tret.*
     11
4236 *Neat pound* at *6 d.*

$6\frac{1}{2}$211|8 *d.*

105 : 18—0 *facit.*

III. If the Allowance for *Tare* be 8 lb, 10 lb, 12 lb, in 112, or any other lesser Number, whether an Aliquot part of 112 or not, in such case divide the Gross into two parts by 2, which will make it half hundreds, then say, 8 is $\frac{1}{7}$ of $\frac{1}{2}$ *C.* (or) if 12 lb in 112 lb.

$8\frac{1}{7}$ } When you have found your *Tare*, subtract it
$4\frac{1}{2}$ } always out of the whole *Gross.*

I might enumerate Examples, but these being sufficient to instruct any ordinary Capacity in *Tare* and *Tret.*

I shall proceed to shew some other abbreviated ways of casting up Goods and Merchandize.

CHAP.

CHAP. XIV.

For Retailers of small Parcels, *as Mercers, Linnen, and Wollen Drapers, Haberdashers of Hats*, &c.

THE most Abbreviated and ready way is to multiply the Price by the Quantity.

Ex. Sold 7 Yards of Cloth at 14 : 6 a Yard.

	s.	d.
	14 :	6
		7
facit l. 5 :	1 :	6

Say 7 times 6 is 42, which is 3 *s.* 6 *d.* set down 6 *d.* and carry 3 *s.* to the place of Shillings, and say, 7 times 4 is 28, and 3 I carry is 31, set down 1 *s.* and carry 3 Angels to the place of Tens of Shillings, and say, 7 times 1 is 7, and 3 I carry is 10 Angels, which 5 *l.* set a (0) in the place of Shillings, and fix the 5 *l.* in the place of pounds, so the price of 7 Yards is 5 *l.* 1 *s.* 6 *d.*

Ex. 2. Sold 11 $\frac{1}{2}$ Yards at 13 : 03

	l.	s.	d.
		13 :	03
			11
	7 :	05 :	09
		6 :	07 $\frac{1}{2}$
Facit l.	7 :	12 :	04 $\frac{1}{2}$

For half a Yard take half of 13 *s.* 3 *d.* and add to the Product of 11 Yards.

	l.	s.	d.
Ex. 3. Sold 14 $\frac{5}{8}$ Yards at	1 :	07 :	11
	9 :	14 :	11
	19 ;	09 :	00
$\frac{4}{8}$ — $\frac{1}{2}$ —	00 :	13 :	11
$\frac{1}{8}$ — $\frac{1}{4}$ —	00 :	03 :	00
Facit l.	20 :	07 :	00

Find the first Price of 7 Yards, *fa.* 9 *l.* 11 10 *d.* which multiplied by 2, gives 9 *l.* 9 *s.* 8 the price of 14 Yards, then take the Aliquot pa of $\frac{5}{8}$ for the Price of one Yard, as you see in Operation: The *facit* is 20 *l.* 7 *s.* 0 *d.* $\frac{3}{4}$.

	l.	s.
Ex. 4. Sold 7 C $\frac{1}{2}$ of Currants at	2 :	13
	18 :	14
	1 :	06
Facit	20 :	01

Object. There are many Numbers under 100 th are not included in the Multiplication Table, being multiplied together, will not produce th given quantity; and so consequently cannot done by this new way of Practice.

Answ

Anſw. It's very true, there are ſeveral Numbers under 100, that no two Numbers multiplied together can produce them, ſuch as 13, 17, 19, 26, 29, 31, 34, 37, and many more.

Rule. In ſuch caſes multiply by two ſuch Numbers as being multiplied together, will come neareſt to ſuch odd Numbers, then multiply the price by that part which wants to make up the given quantity. An Example of which followes.

	s. d.
5. *Ex.* 29 *Ells* at	7 : 9
	7
	2—14 : 3
	4
	10 : 17 : 0
	7 : 9
facit	11 : 04 : 9

Here I multiply by 7 and 4, becauſe 7 times 4 is 28, and for the odd Ell to make it 29, I add the price of the Ell to the Product, *fa.* 11 *l.* 4 *s.* 9 *d.*

Example 6. If 34 Ells at the ſame price multiplied by 8 and 4, makes 32, and multiply the price of one Ell by 2, and that add to the product, makes 34.

	C.	qr.	lb.		l.	s.	d.
7 Example.	15	3	7	at	4	15	06
							5
					23	17	06
							3
					71	12	06
					2	07	09
					1	03	10 $\frac{11}{22}$
						5	11 $\frac{11}{22}$
					l. 75	10	01 ff

Goods Sold by 112 lb. the C. weight. } 1. Account 2 *s.* 4 *d.* for eve Farthing in the place of 1 pou weight.

	d.		lb.
Ex. 1 At	$3\frac{1}{2}$	the Pound, what	112
	14		32 : 8 *d.*

2. Or multiply the Pence that 1 Pound wei cost by 7, and divide by 15, the Quotient is price in Pounds of a hundred weight.

Ex. At 5 *d.* the Pound, what cost 112 ?

7 — Say, 15 in 32, 2 times, rest which is 100 Shillings, then 15

15) 35 — 100, 6 times, rest 10, it ma

s. d. — 120 *d.* then 15 in 120 is 8 tim

facit l. 2-6-8 — *facit* 2 *l.* 6 *s.* 8 *d.*

3. Multiply the Pounds in Money that 112 c by 15, and divide the Product by 7, the Quoti gives the Price 1 Pound cost.

	lb.	l.	s.	d.	lb.
If	112 cost 2	: 06	8	what cost	1
				5	
		11 :	13 :	4	
				3	
	7)	35 :	00 :	0	

facit 5 pence.

Goods sold by 100 } 4. Multiply the pence that 1 lb. cost by 5, and divide by 12, the Product is the price in Pounds.

At 15 *d.* the Ounce, what cost 100 Ounces?

5

12) 75

facit l. 6 : 5 *s.*

5. Multiply the Pounds in Money 100 lb. weight cost by 12, and divide by 5. the Quotient gives in pence the price of 1 Pound.

	lb.	l.	s.	lb.
If	100 cost	6 ——	5	what cost 1?
			12	
	5)	75 :	00	
		15 :		*facit* 15 *d.*

Things sold by 120, *such as* Deals, &c.

6. Multiply the Pence that 1 cost by 2, and divide by 4, the Quotient is the price of 120.

Wha

What cost 120 Deals at 13 *d.* the Deal-board?

2

4) 26 *s.*

facit 6 : 10

7. Or divide the Pence that one is worth the Quotient will be Pounds.

What cost 120 Yards of Ribbon at 5 *d.*?

facit 2 *l.* 10

8. For things sold by 200, annex only a Cypher to the Sum of the given Price.

What cost a Bale of Paper, quantity 200 Ream at 6 *s.* a Ream? *Facit* 60 *l.*

Wine or Oyl sold by the Tun of 252 Gallons.

9. So many Pound the Tun cost, abate so many Shillings, and the Gallon will be worth so many Pence.

Ex. If 252 Gallons cost 25 *l.* what cost 1 Gallon?

1 : 5

s. *d.*

23 : 15 *facit* 1 : 11

Here 20 *s.* is valued at 1 penny, so that 23 15 *s* is but 1 *s.* 11 *d.* $\frac{3}{4}$. the price of 1 Gallon Oyl.

10. For things sold by 300, annex a Cypher to the price of one, take half, and add them together.

What cost 300 Chaldron of Coals at 25 *s.*

250

125

375

11. For things sold by 500, put a Cypher to the price, then double it, take half, and add the two last together.

What

What cost 500 Quarters of Corn, at 31 *s.* a Quarter.

310 *s.*
2

620
155

facit 775 Pound.

12. For things sold by 900, put a Cypher and treble it.

What cost 600 Hats at 9 *s.*

90
3

facit 270 Pound.

13. For things sold by 600, put a Cypher, treble it, take half, and add the two last together.

What cost 700 Gallons at 11 *s.*

110
3

330
55

facit 385 Pound

There are abundance of other short ways, which cannot well be comprised in this little Tract: These already given are sufficient for any ingenious inventive Head to lay a good Foundation, from whence he may raise what Structure he please.

CHAP. XV.

INTEREST is either *Simple* or *Compound.*

SImple *Intereſt* is that which ariſeth or is com-puted from the Principal only. And here a Queſtions are done by the Double Rule of Three (called the Compound Rule of five Numbers) or Practice.

Example. What will the Intereſt of 275 *l.* 11 *s.* 3 *d.* come to for a Year, at 6*l. per Cent.*

State your Queſtion by the Rule of Three, and ſay,

	l.		*l.*	*s.*	*d.*
If 100 gain	6,	what will	275 :	11 :	3
					6
			l. 16|53 :	07 :	6
			s. 10|67 :	20	
				12	
			d. 8|10		

	l.	*s.*	*d.*
facit	16 :	108 :	$\frac{10}{100}$

Here 275 *l.* 11 *s.* 3 *d.* Principal is multi-plied by 6 *l.* (the Intereſt) being the middle Number, and divided by 100 the firſt Number by cutting off the two Figures in the Dividend, reſt 53 *l.* which multiplied by 20, gives 1067 ſhil-lings, which divided again by 100 as before, reſt 67 *s.* which multiplied by 12, and divided

an

as before gives *facit* 16 *l.* 10 *s.* 8 *d.* the Interest for 1 Year.

```
 l.    s.   d.
275 : 11 : 3  for a Year at 5 l. per Cent.
            5
---------------
13|77 : 16 : 3
----------20
15|56
----------12
6|75
facit 13 : 15 : 16 75/100.

 l.    s.   d.
275 : 11 : 3 at 5 1/2 per Cent.
            5
---------------
1377 : 16 : 3
1/2 137 : 15 : 7 1/2
---------------
15|15 : 11 : 10 1/2
----------20
3|11
----------12
1|42
----------4  l.  s.  d.
1|70 facit 15—3—1 1/4 70/100
```

What comes the Insurance of 975 *l.* 13 *s.* 4 *d.* to, at 4 Guinea's *per Cent.*

	l.	*s.*	*d.*	
	975	13	4	
			4	6 y.
	3902	13	4	
$5\frac{1}{4}$	243	18	4	
$1\frac{1}{5}$	48	15	8	
	41|95	07	4	
		20		
	19|07			
		12		
	00|88			
		4		
	3|52			

facit 41 : 19 : 0 $\frac{3}{4}$ $\frac{52}{100}$ (*l. s. d.*)

l.	*s.*	*d.*
275	11	3 at 5 *per Cent.* for 14 Months.

	l.	*s.*	*d.*
The Int. of 1 Year is	13	15	06
2 Months $\frac{1}{8}$	2	5	11
facit	16	01	05 Int. for 14 m

l,	*s.*	*d.*
275	11	3 at 5 *per Cent.* for 3 Years, 5 Months

20 Days.

The

		l.	s.	d.
The Interest of a Year is		13	15	06
hich multiplied by the 3				3
ears, and take Aliquot				
arts for 5 Months and 20	*m.*	41	6	6
ays, as you see in the	4 $\frac{1}{3}$	4	11	10
peration	1 $\frac{1}{4}$	1	2	11 $\frac{1}{2}$
days	10 $\frac{1}{3}$	0	7	7 $\frac{3}{4}$
	10 $\frac{1}{3}$	0	7	7 $\frac{3}{4}$
produces *facit*		47	16	7

The way used by Bankers for casting up Interest s generally by days, thus,

They bring the Principal Money into Pence, and nultiply it by the Days it is out at Interest, and di-vide by 6083 for 6 *per Cent.* And 7300 for 5 *per Cent.* (which are the Days of a Year multiplied by 100, and divided by the rate of Interest) An Ope-ration in the Compound Rule of five Numbers, *viz.*

If 100 *l.* in 365 days gain 6 *l.* Interest, what will 75 *l.* gain in 94 days?

Example.

l. *s.* *d.*
Example. 275 : 11 : 3 at Interest 70 Da
(*6 per* 1

```
   20         12) 761 pence (6) 36500
 ----             ---           -----
 5511            6|3 : 5         6083
   12         ---------
 ----
66135         fac. 33 : 5
   70
-----
6083) 4629450
----   37135
761     6370
       -----
         287
```

Example. 100 *l.* at Int. for 75 days at 5 *per* C

```
   20         facit 20 s. 6 d.
 ----
 2000
   12                    365
 ----                    100
24000                   ----
   75               5) 36500
-----                  -----
120000                  7300
168000
------             73|00|18000|00
18000|00           -------- 340
                   12) 246| 480
                   ---------------
               facit 20 : 6 : 42 .
```

CHA

C H A P. XVI.

ompound Intereſt *is that which ariſeth from the* Principal, *and alſo from the* Intereſt *thereof, and therefore is called* Intereſt *upon* Intereſt.

THIS ſort of Intereſt is counted very unlawful, and is ſeldom or never allowed, but by particular Contract or Valuation of Money ſometimes on urchaſes.

The beſt way of working this ſort of Intereſt is Decimals.

Example. 275 *l.* 11 *s.* 3 *d.* forborn 5 years, at per *Cent. per Annum*, Intereſt upon Intereſt, what ll the ſame amount to?

Reduce the 11 *s.* 3 *d.* into a Decimal Fraction, cording to the Third Rule of the Eighteenth hapter of this Book.

11 *s.* 3 *d.* $\frac{135}{240}$ of a Pound *Sterling*.

hich brought into a Decimal Fraction, is 5625: e Operation of the Queſtion is, *viz.*

If

	l.	*l.*	*l.*
If 100 gain 6, what will,			275, 5625
			16, 5337
1 Year			292, 0962
			17, 5257
2 Year			309, 6219
			18, 5773
3 Year			328, 1992
			19, 6919
4 Year			347, 8911
			20, 8734
5 Year			368, 7645

Facit 368 *l.* 15 *s.* 4 *d*

Here the third Number is multiplied by 6, Second Number, and divided by 100 the first Nu ber, which is done by setting out the two first gures towards the Right hand, and casting th away as you multiply them, to abbreviate the wo of Multiplications, which would be very large, we they all set down, where 15, or more Years Inter is forborn, besides 4 or 5 places of Decimals wil correct to a Farthing, or little more, so that the *cit* makes 368 *l.* 15 *s.* 4 *d.* the Decimal Fracti being valued according to the sixth Rule of eighteenth Chapter of this Book.

C H A

CHAP. XVII.

Rebate or Discount *is when a Sum of Money due at any time to come, is satisfied by the Payment of so much present Money, as being put forth at a certain* Rate of Interest *for the time being, will be equal to the Sum first due.*

IN *Rebate*, 12 Months is the *first* Number, the Rate of Interest the *second*, and the time proposed the *third* Number.

Then say, If 100, and that *facit* (added together) abate that *facit*, what shall the given Sum Rebate?

The Quotient or Quotients shew the Rebate; which subtracted out of the given Sum, shews the *Money* to be paid presently.

Exam. What will the Rebate of 795 *l.* 11 *s.* 2 *d.* come to for 11 Months, at 6 *l.* *per Cent.*

If 12 Months give 6 *l.* what will 11 Months? *facit* 5 *l.* 10 *s.* Then

If 105 *l.* 10 *s.* Rebate 5 *l.* 10 *s.* what will 795 *l.* 11 *s.* 2 *d.* *facit* 41 *l.* 9 *s.* 5 *d.*

Exam. 2. The Rebate of 765 *l.* 11 *s.* 2 *d.* come to for 17 Months at 6 *per Cent.*

If 12 Months give 6 *l.* what will 17 Months; *facit* 8 *l.* 10 *s.*

If 108 *l.* 10 *s* Rebate 8 *l.* 10 *s.* what 795 *l.* 11 *s.* 2 *d.* *facit* 62 *l.* 6 *s.* 5 *d.*

Exam.

Exam. 3. Sold Goods for 795 *l.* 11 *s.* 2 *d.* to
paid at 2, 3 Months (*that is half at 3 Months,*
the other half at 3 Months after that) if all
Money be paid presently, what must be discount
First, Divide the given Sum into two parts
cording to the time of Payment, as you see he
Then say,

If 12 Months give 6 *l.* what will 3 Months? *facit* 1 *l.* 10 *s.* 2)

l.	*s.*
795	11
397	15

If 101 *l.* 10 *s.* abate 1 *l.* 10 *s.* what will 39
15 *s.* 7 *d.* *facit* 5 *l.* 17 *s.* 6 *d.*

If 12 Months give 6 *l.* what will 6 Mon
give? *facit* 3 *l.*

If 103 *l.* abate 3 *l.* what will 397 *l.* 15 *s.*
facit 11 *l.* 11 *s.* 8 *d.*

Add the Sum of the Rebates together, and su
tract it out of the given Sum, gives the *Money* to
paid presently.

l.	*s.*	*d.*				
				795	11	
397	15	7	for 3 Months	5	17	
397	15	7	for 6 Months	11	11	
			All the Rebate	17	09	
			The *Money* to be paid presently	778	02	

Exam

Exam. 4. Sold Goods for 795 *l.* 11 *s.* 2 *d.* to be paid at 3, 2 Months, if all the *Money* be paid presently, what must be discounted?

Divide the given Sum into three parts, and work as before, *facit* 15 *l.* 10 *s.* 11 *d.* $\frac{1}{2}$.

Exam. 5. Sold Goods for 795 *l.* 11 *s.* 2 *d.* to be paid at 4, 1 Months, if all the *Money* be paid down, what must be discounted? *fa.* 9 *l.* 15 *s.* 9 *d.* $\frac{1}{3}$.

Divide your Money into four payments, then work as before, *viz.*

12 *mo.*——6 *l.* —— 1 *mo.* —— *facit* 10 *s.*
100 *l.* 10 *s.* abate 10 *s.* what will 191 *l.* 17 *s.* 9 *d.*
facit 19 *s.* 9 *d.*

12 *mo.*——6 *l.* —— 3 *mo.* *facit* 1 *l.*
100 *l.*—1 *l.*—198 *l.* 17 *s.* 9 *d.* *fa.* 1 *l* 19 *s.* 4 *d.*

12 *mo*——6 *l.*——2 *mo.*——*facit* 1 *l.* 10 *s.*
101 *l.* 10 *s.* abate 1 *l.* 10 *s.* what 198 *l.* 17 *s.* 9 *d.*
facit 2 *l.* 18 *s.* 9 *d.*

12 *mo*——6 *l.* ——4 *mo.*——*facit* 2 *l.*
102 *l.* abate 2 *l.* what will 198 *l* 17 *s.* 9 *d.*
facit 3 *l.* 17 *s.* 11 *d.*

l.	*s.*	*d.*
0	19	9
1	19	4
2	18	9
2	17	11
[illegible]	15	9

	l.	*s.*	*d.*
	795	11	2
rebated	9	15	3
Facit	795	15	9

to be paid down.

CHAP.

CHAP. XVIII.

FRACTIONS

Are of Two kinds { *VULGAR* and *DECIMAL*.

A *VULGAR FRACTION* is caused [illegible] Division of whole Numbers, the Remainder [illegible] which being less than the Divisor, called the Num[illegible]rator, is always the Dividend, and the Denominat[illegible] is the Divisor.

$$\frac{3}{4}$$ 3 Numerator. 4 Denominator.

A DECIMAL FRACTION is such [illegible] *one*, whose Denominator is understood, and there[illegible]fore need not be expressed: And is an *Unit* wi[illegible] as many Cyphers following it, as there be Figur[illegible] and Cyphers in the Numerator.

Decimal Fractions, whether they stand alone, [illegible] be joyned with Integers, have always a Comma [illegible] Point before them to distinguish 'em from Integer[illegible] as 5 ,36 ,0042.

In *Decimals* the *value* of every Figure or C[illegible]pher *decreases* by a Ten-fold Proportion fro[illegible] the Units place towards the *right hand*, as th[illegible] whol[illegible]

vhole Numbers do increase the value towards the eft hand, by the like Proportion, as you may see n the following Table.

whole Numbers,							Decimals.				
6 C *Thou.*	5 X *Thou.*	4 *Thou.*	3 C.	2 X.	1 *Units.*	.	2 *Tenths.*	3 *Hund.*	4 *Thou.*	5 X *Thou.*	6 C *Thou.*

Cyphers before Integers, and at the end, or right and of Decimals are of no value, but after Integers and before Decimals they have their value, for Integers they increase, and in Decimals they diminish the value of the other Figures joyned with hem.

In Integers 005 is but 5, and 004 is but 4, and 6 is but 6.

But in Decimals, ,005 is $\frac{5}{1000}$, and ,034 is $\frac{34}{1000}$, and ,06 is $\frac{6}{100}$.

And again, in Integers 500 is five hundred, and 00 is four hundred.

In Decimals 500 is but 5, and 400 is but 4, *&c.*

Next to Abbreviation and Valuation of *Vulgar actions*, there is little required but to know how bring a *Fraction* of a *lesser* Name into the Fraction a *greater* Name: And to reduce *Fractions* of divrs unequal *Denominators* to one common *Denominator*, which being well understood, you may with much ease *Add*, *Subtract*, *Multiply* and *Divide* a action, as you can a whole Number.

H In

In *Decimals* a Fraction is seldom abbreviated therefore,

I. *To abbreviate any Vulgar Fraction,* find such Number for dividing both the Numerator and Denominator thereof, so that no remainder be of either of the Divisions.

Ex. Abbreviate $\frac{96}{120}$ into $\frac{8}{10}$ $\frac{4}{5}$ its lowest term.

Say, 12 in 96, 8 times, and 12 in 120, 10 then the Fractions is $\frac{8}{10}$, then say, 2 in 8, 4 times and 2 in 10, 5 times, then the Fraction is $\frac{4}{5}$, so that 4 is to 5, as 96 to 120.

2. *To know what part of a Pound Sterling any Number of Shillings and Pence are,* bring the Shillings and Pence into Pence for a Numerator, and place 240 under it, (the Pence of one Pound) for a Denominator.

Exam. What part of a *l.* is 11 *s.* 3 *d.*

$\frac{12}{135}$. *facit* $\frac{135}{240}$.

3. *To Reduce Vulgar Fractions into Decimals,* Add Cyphers at pleasure to the Numerator, and divide by the Denominator. *Example, viz.*

Reduce 11 *s.* 3 *d.* into a Decimal Fraction.

```
  12                24|0) 1350000
 ----             ------   150
 135                        60
 ----       facit 5625     120
 240                      -----
                             0
```

Ex

Exam. Reduce $\frac{4}{5}$ into a Decimal Fraction.

$$\begin{array}{r} 5)\ 4000 \\ \hline ,800 \end{array}$$

facit ,800

4. *To value a Vulgar Fraction,* Multiply the Integer into the Numerator, and divide by the Denominator.

What is the $\frac{5}{8}$ of a Pound *Sterling*?

$$\begin{array}{r} 20\ s. \\ 5 \\ \hline 8|100\ d. \\ \hline \end{array}$$

facit 12--6

An Ell worth 7 : 9 (*s.* *d.*) what is $\frac{3}{5}$ worth

$$\begin{array}{r} 7 : 9 \\ 2 \\ \hline 5)\ 15 : 6 \\ \hline \end{array}$$

facit—3 : 1 $\frac{1}{3}$

5. *To value a mixt Number,* Multiply the mixt Number by the Numerator, and Divide by the Denominator. *Exam. viz.*

A Ship worth 794 : 11 : 9 (*l.* *s.* *d.*) what is $\frac{5}{8}$ worth?

$$\begin{array}{r} 794 : 11 : 9 \\ 5 \\ \hline 8)\ 3972 : 18 : 9 \\ \hline \end{array}$$

facit 496 : 12 : 4 $\frac{1}{8}$

6. *To value a Decimal Fraction expressing Coin*, every *Prime or Unit* in the first place is 2 *s.* value, every 5 in the second place is 1 *s.* and the rest Farthings; but if they exceed $\frac{25}{48}$, there must be one Farthing abated.

Reduce $\frac{7}{9}$ of a Pound into a Decimal Fraction.

9) ,700000

,77777

Here 7 *Primes* is 14 *s.* and 5 taken out of the second place is 1 *s.* which makes 15 *s.* then 2 remains, which is 27 to the *thirds*, or place of Farthings, out of which abate 1 for $\frac{25}{4}$, it makes *facit* 15 *s.* 6 *d.* $\frac{1}{2}$, which is the $\frac{7}{9}$ of a Pound *Sterling*.

7. *To reduce Vulgar Fractions to a Common Denominator*, Multiply the *Numerator* of each Fraction into every *Denominator*, except its own, which makes that Product *a new Numerator*; then multiply all the *Denominators* continually together, and that Product is a *Common Denominator* to all the *new Numerators*. *Example*, viz.

Reduce $\overset{l.}{\frac{2}{3}}$ and $\overset{l.}{\frac{3}{4}}$ to a *Common Denominator*.
facit $\frac{8}{12}$ and $\frac{9}{12}$.

Here 12 is the *Common Denominator* to both the *New Numerators*, viz. 8 and 9, and you find that 8 is to 12, as 2 to 3, and 9 is to 12, as 3 to 4.

So that $\frac{8}{12}$ is—to $\frac{1}{3}$ *l.* and $\frac{9}{12}$— to $\frac{3}{4}$ *l.*

Reduce $\frac{3}{4}$, and $\frac{5}{6}$, and $\frac{7}{8}$ of a *l.* to a *Com. Denom.*

4			
6	18	40	42
	8	4	4
24			
8	144	160	168
192	192	192	191

To prove your Work, Divide your *New Numerator* by the *Numerator* of that Fraction, and Divide the *Common Denominator* of the Fraction by the *Denominator*, If both Quotients are equal, your Work is true.

Example. $\frac{144}{192} \Big| \frac{48}{48}$, here 144 divided by 3, makes 48, and 192 divided by 4, gives 48, which was to be proved. Or, you may prove your Work by *Abbreviation of Fractions*, but that is attended with much difficulty, where 4 or more Fractions are reduced to a *Common Denominator*.

Now this *Reduction of Fractions* is of little use, otherwise than to prepare a Fraction to be either *Added*, *Subtracted*, *Multiplied*, or *Divided*.

As if the $\frac{3}{4}$ and $\frac{5}{6}$ and $\frac{7}{8}$ *l.* were to be added together, Reduce them first into a *Common Denominator*, as in the last Rule, it makes *facit* $\frac{144}{192}$ and $\frac{160}{192}$ and $\frac{168}{192}$. Add all the *new Numerators* together, make 472, which divided by 192, the *Common Denominator*, makes *facit* 2 *l.* $\frac{88}{192}$, as in the following Example.

Addition of Vulgar Fractions. $\left\{\begin{array}{r} 144 \\ 160 \\ 168 \\ \hline 192)\ 472 \\ \hline 2)\ 88 \end{array}\right.$

l. *s.* *d.*

2) 88 *facit* $2\frac{88}{192}$, or 9 : 2

And if the $\frac{3}{4}$ and $\frac{5}{6}$ and $\frac{7}{8}$ *l.* were to be added together in *Decimals*, reduce them first into *Decimall Fractions*, according to the *Third Rule* of this Chapter, and the Operation stands, *viz.*

,0000

Addition of Decimals. $\left\{\begin{array}{ll} \frac{3}{4} & ,75 \\ \frac{5}{6} & ,8333 \\ \frac{7}{8} & ,875 \end{array}\right.$ Say 4 in 30 is 7 times, and 4 in 20 is 5 times, and so for the rest.

l. *s.* *d.*

facit 2 ,4583 or, 2 : 9 : 2

By this Addition you see how much less work is made by *Decimals* than is in *Vulgar Fractions*, and how easie their Value is found out according to the *Sixth Rule* of this Chapter.

8. *To Reduce (Compound Fractions, or) Fractions, of a lesser Name into the Fractions of a greater*, Multiply the *Numerators*, together for a new *Numerator*, and the *Denominators* multiply together for a new *Denominator.*

Reduce $\frac{3}{4}$ of a Penny into the proper Fraction of a pound *Sterling.*

Say, $\frac{3}{4}$ of $\frac{1}{12}$, or $\frac{3}{4}$ of $\frac{1}{240}$ *facit* $\frac{3}{960}$.

9. *To reduce a mixt number of a lesser Name into the Fraction of a greater.* Reduce the mixt Number into an improper Fraction, and work as before.

Reduce

Reduce 3 *d.* $\frac{1}{2}$ into the proper Fraction of a pound *Sterling*.

$\frac{7}{2}$ of $\frac{1}{12}$ of $\frac{1}{20}$, or $\frac{7}{2}$ of $\frac{1}{240}$, *facit* $\frac{7}{480}$.

By the same *Rule* you may *Reduce* any sort of Weight or Measure.

For Compound Fraction, their use is chiefly to bring Fractions of divers Denominations to one and the same Denomination.

As if the $\frac{3}{4}$ of a Penny, $\frac{2}{3}$ of a Shilling, and $\frac{7}{8}$ of a Pound were added together.

The $\frac{3}{4}$ of a Penny must be reduced into the Fraction of a Pound, and the $\frac{2}{3}$ of a shilling, must be Reduced into the Fraction of a Pound thus,

of $\frac{1}{240}$. *fa.* $\frac{3}{960}$
of $\frac{1}{20}$. *fa.* $\frac{2}{60}$

Then the Fractions to be added, are $\frac{3}{960}$, and $\frac{2}{60}$, and $\frac{7}{8}$, which reduce to a Common Denominator, and add them together, either by Decimals or Vulgar Fractions.

CHAP. XIX.

ADDITION of FRACTIONS

IF *the Fractions to be added have one Common Denominator*, Add all the Numerators together, and divide the Product by the Common Denominator.

Example. Add $\left\{\begin{matrix}\frac{8}{12}\\ \frac{5}{12}\\ \frac{7}{12}\end{matrix}\right\}$ of a pound together.

12) 20

facit 1 $\frac{8}{12}$

2. *If the Fractions to be added be of different Denominators,* Reduce them to a Common Denominator according to the *Seventh Rule* of the last Chapter and proceed as before.

Example. Add $\frac{7}{8}$ and $\frac{3}{4}$, and $\frac{2}{3}$ *l.* together.

8			
4	28	24	8
	3	3	8
32			
3	84	72	64
96	96	96	96

96) 22

facit 2 :

To add $\frac{7}{8}$ and $\frac{3}{4}$ and $\frac{2}{3}$ *of a Pound in Decimals,* Reduce them into Decimal Fractions, according to the *Third Rule* of the last Chapter, and add them up as in whole Numbers, keeping the place of Units just under each other.

0000

Add $\frac{7}{8}$,875
$\frac{3}{4}$,75
$\frac{2}{3}$,6666

l. *s.* *d.*
2,2916 *facit* 2 : 5 : 10

8)7,000
,8
4),300
75
3),200
,66

CHA

CHAP. XX.

Subtraction of Fractions.

I. *TO Subtract Fractions of different Denominators* Reduce them to a Common Denominator, and Subtract the lesser from the greater.

Example. From $\frac{3}{4}$ *l.* take $\frac{3}{4}$ *l.* from $\frac{9}{12}$
$\quad$ 9 $\quad$ 8 $\quad$ take $\frac{8}{12}$

facit $\frac{1}{12}$

II. *If you have a mixt Number, (or Integer and Fraction) and the Fraction to be subtracted be greater than the Fraction from which you are to subtract.*

Borrow an Integer from the mixt Number, and work as in the Subtraction of whole Numbers.

Ex. From 11 $\frac{2}{3}$ — $\frac{8}{12}$
$\quad$ 2 $\frac{3}{4}$ — $\frac{9}{12}$

$\quad$ 8 — $\frac{11}{12}$

Here I cannot take $\frac{9}{12}$ out of $\frac{8}{12}$, therefore I borrow an Integer, *viz.* 12, and say, 9 out of 12, rest 3, to which add $\frac{8}{12}$, rest $\frac{11}{12}$, and carry 1 to 3 in 3 *l.* out of 11 *l.* rest 8, so the *facit* is 8 $\frac{11}{12}$.

From 35 $\frac{3}{12}$	from 42
take 19 $\frac{7}{12}$	take 16 $\frac{15}{24}$
facit 15 $\frac{8}{12}$	*facit* 25 $\frac{9}{24}$

Subtraction of Decimals is the same as in whole Numbers, keeping the place of Units just under each other.

	l.		l.	s.	d.
From	$\frac{7}{8}$,875	the $\frac{7}{8}$ is		17	6
take	$\frac{3}{4}$,75	$\frac{3}{4}$ is		15	
Rest	,125 or 2 s. : 6 d.	rest		2	6

equal to the Decimal, ,125

CHAP. XXI.

Multiplication of Fractions.

I. TO *Multiply proper Fractions*, Multiply the Numerators together for a new numerator, and the Denominators multiply together for a Denominator.

Example. Multiply $\frac{7}{8}$ by $\frac{3}{4}$, *facit* $\frac{21}{32}$.

II. *If a mixt Number and a Fraction are to be multiplied together*, Reduce the mixt Number into an improper Fraction, and work as in the last.

Ex. Multiply 11 $\frac{2}{3}$ by $\frac{3}{4}$

$\frac{35}{3}$ by $\frac{3}{4}$, *facit* $\frac{105}{12}$.

Ex. Multiply 11 $\frac{2}{3}$ l. by 2 $\frac{3}{4}$ l.

$\frac{35}{3}$ by $\frac{11}{4}$, *fa.* $\frac{385}{12}$ or 32 l. : 1 s. : 8 d.

III. *To multiply a mixt Number by an Integer*, Make the Integer an improper Fraction by placing [1] under it, and Reduce your mixt Number into an improper Fraction, and work as in the *first Rule*.

Ex.

Example. Multiply $7\frac{5}{8}$ by 4.

$\frac{61}{8}$ by $\frac{4}{1}$, *facit* $\frac{244}{8}$.

IV. *Multiplication of Decimals* is the ſame as in whole Numbers, ſaying as many Decimal parts as are in the Multiplicand and Multiplier, ſo many muſt be cut off from the Product, which if it have not ſo many places, the defect muſt be ſupplied with Cyphers towards the left hand.

	11 ,83
Multiply ,1005	2 87
by ,031	
1005	8281
3015	9464
	2366
facit ,0031155	33 ,9521

CHAP. XXII.

DIVISION of *FRACTIONS.*

I. *TO Divide Single Fractions:* Reduce them to a Common Denominator, and divide the new Numerator of the Dividend, by the new Numerator of the Diviſor.

Example, Divide $\frac{7}{8}$ by $\frac{3}{4}$, 24) 28

28 24 *facit* $1\frac{4}{24}$

If

II. If it happens that the Fraction of the *Divisor* be greater than the Fraction of the Dividend, after you have Reduced them to a Common Denominator, the *facit* of ſuch Diviſion is a Fraction.

Example. Divide $\frac{3}{4}$ by $\frac{7}{8}$.

$$\begin{array}{ccl} \overline{} & \overline{} & \\ 24 & 28 & \textit{facit } \frac{24}{28} \end{array}$$

III. *To Divide an Integer by a Fraction*, Multiply the Integer into the Denominator, and Divide by the Numerator.

Example. Divide 8 by $\frac{5}{6}$.

$$5)\ \overline{48}$$

facit $9\ \frac{3}{5}$.

IV. *To Divide a Fraction by an Integer*, The Numerator is Numerator, and the Integer multiplied by the Denominator, is Denominator.

Example. Divide $\frac{3}{4}$ by 3,

$$\begin{array}{rl} 4 & \\ 3 & \\ \hline 12 & \textit{facit } \frac{3}{12}. \end{array}$$

V. *To Divide a mixt Number by an Integer*, Reduce the mixt Number into an improper Fraction, whoſe Denominator multiply by the Integer for your Diviſor.

Divide

Divide $3\frac{3}{8}$ by 2

$\frac{27}{8}$ by $\frac{2}{1}$ 16) 27

1 —— $\frac{11}{16}$ *facit* $1\frac{11}{16}$.

VI. *To Divide a mixt Number by a Fraction*, Reduce the mixt Number into an improper Fraction, and work as before.

Example. Divide $3\frac{3}{4}$ by $\frac{4}{7}$

$\frac{15}{4}$ by $\frac{4}{7}$

105 16) 105

9

facit $6\frac{9}{16}$.

VII. *To divide an Integer by a mixt Number*, Reduce the mixt Number and Integer into improper Fractions, and proceed as before.

Example. Divide 5 by $\frac{3}{5}$

$\frac{5}{1}$ by $\frac{18}{5}$ 18) 25

7

facit $1\frac{7}{18}$

VIII. *To Divide a mixt Number by a mixt Number*, Reduce them into improper Fractions and Divide as before.

Example. Divide $3\frac{3}{5}$ by $2\frac{3}{4}$

$\frac{18}{5}$ by $\frac{11}{4}$ 55) 72

facit $1\frac{17}{55}$ 17

Division of Decimals is the same as in whole Numbers, till the Work be done. And then use the

the Converse of the Rule for Multiplication, *viz.* so many *Decimals* as are in the Dividend, so many there must be in the *Divisor* and *Quotient*: And if there be not so many, the *Quotient* must be supplied with Cyphers towards the left hand.

Example. Divide 33,9521 by 2,87

```
   2,87)          525
                  2382
facit 11,83        861
                  ----
                    00
```

See the Converse in Multiplication of Decimals.

CHAP. XXIII.

The Rule of Three in Fractions.

RULE: You must multiply your Second and Third Numbers together, and divide by your First.

Observing the same Method as in whole Numbers, *viz.* That the first and thirds Numbers be of one Name or Denomination.

Ex. If $\overset{d.}{3\frac{1}{2}}$ buy $\overset{lb.}{\frac{2}{3}}$ of *Tobacco*, what shall $\overset{l.}{95\frac{3}{4}}$ buy?

$\frac{7}{2}$ of $\frac{1}{240}$

$\overset{l.}{\frac{7}{480}}$ — $\overset{lb.}{\frac{2}{3}}$ — $\overset{l.}{95\frac{3}{4}}$

4

$\frac{383}{4}$ by $\frac{2}{3}$

$\frac{766}{12}$ *facit.*

Divide

Divide $\frac{766}{52}$ by $\frac{7}{480}$

$$\begin{array}{rrr} & 7 & 766 \\ \hline & 84 & 2880 \\ & & 2880 \\ & & 3360 \\ \hline 84) & & 367680 \\ & & 316 \\ \textit{facit } 4377 \text{ lb.} & & 648 \\ \textit{of Tobacco} & & 600 \\ \hline & & 12 \end{array}$$

CHAP. XXIV.

Menſuration of Plain Superficies.

The Menſuration of plain Superficies (or Flat Meaſure) *ſuch as Board, Glaſs, Wainſcot, Painting, and the like.*

Note 1. THAT in *Superficial Meaſure*, 12 times 12 Inches, being 144 Inches, are the Number of Inches contained in a Square Foot of Superficial Meaſure.

2. That to ſquare any Number, is to multiply it in it ſelf, as if you would know how many ſquare Feet is contained in a Yard ſquare. Multiply 3, the Feet in one Yard by 3, the Product is 9, and ſo many Feet make a Yard ſquare.

Example.

Example. How many ſquare Inches are there in a Yard ſquare?

$$
\begin{array}{rl}
1 \text{ Yard is } 3 & \text{Feet} \\
12 & \\
\hline
36 & \text{Inches} \\
36 & \\
\hline
216 & \\
108 & \\
\hline
\textit{facit } 1296 & \text{Inches.}
\end{array}
$$

General Rule is to multiply the length by the breadth, the Product is the Content.

Ex. 1. A Board 12 Foot long, and 14 Inches broad, how many ſquare feet?

$$
\begin{array}{r}
12 \\
12 \\
\hline
144 \\
14 \\
\hline
576 \\
144 \\
\hline
144)\ 2016 \text{ Inch.} \\
\textit{facit } 14 \text{ feet } 576 \\
\hline
00
\end{array}
$$

inch. 12 foot.

$\frac{1}{6}$ —— 02

facit 14 ſquare feet.

But the beſt way is to take Aliquot parts for 14 Inches, as you ſee wrought in the laſt Example. And this being the moſt practical and ready way, I ſhall purſue it in all the Variety of Superficial Menſuration that followeth.

Ex-

Ex. 2. A piece of Wainfcot 24 Foot, 9 Inches long, and 11 foot deep, how many fquare Yards?

```
foot inch.
  24—9
     11  Mult.      Or thus,
-------------
9) 272—3
-------------
fa. 30 0 8

        yd. fo. in.
         8—0—9 long.
         3—2—0 deep.
        ------------
        24—2—3
1  1/3—2—2—3
1  1/3—2—2—3
------------------
facit 30—0—9
```

Here 24 Foot 9 Inches is multiplied by 11 Foot, the height, which makes 272 Foot 3 Inches, that divided by 9, gives 30 Yards, 8 Inches, and $\frac{3}{4}$.

But the eafieft and beft way is to bring the height and length into Yards, and then multiply them as you fee in the Example following.

Example 3. A Painter hath done a Room 98 Foot about, and 11 $\frac{1}{2}$ Foot high, I demand the fquare Yards therein?

```
                          foot
        yd. fo. in.       3) 98
        32—2—0            -----
         3—2—6              32—feet
        ----------
        98—0—0
1  1/3—10—2—8                yds. feet in.
1  1/3—10—2—8             Anf. 125—0—08
6  1/2— 5—1—4
-----------------
Facit 125—0—8
```

Example. A *Glaſier* hath done a Pane of Glaſs of 5 Foot, 73 high, and 2 Foot, 54 broad, at 6 d. the Foot ſquare.

Note, The *Glaſiers* Foot is divided into 10 parts, and every part into 10 parts more.

5, 73
5, 54
2292
2865
1146
14, 5542 foot.

Facit 14 ½ or 14, 5542

A General Rule to Meaſure Round or Square Pillars.

Multiply the length by the Circumference or *Round* *Pillars.*

And for *Square Pillars*, add the four ſides or breadth together, and multiply the Total by the length.

Example 5. A Painter hath done a Piller of 6 Foot 3 Inches Circumference, and 14 Foot 9 Inches long, I demand the Square Yards of Painting?

		yrd.	fo.	in.	
		4	2	9	length.
		2	0	3	circumf.
inch.		9	2	6	
36	3 ½	0	1	1 $\frac{9}{12}$	
	facit	10	1	0 $\frac{9}{12}$	

Example

Example 6. A Pillar 6 Yards 2 Foot 5 Inches ng, and 2 Foot 1 Inch in breadth each ſide, how any ſquare Yards?

	yrd.	fo.	in.	
	6	2	5	length.
	3	0	0	breadth.

yrd. fo. in.
3—0—0 broad. *facit* 20—1—3

For *Regular Poligons*, add all the ſides together, d multiply the Total by the length.

For *Cones*, multiply half the length by the Cir- mference.

For *Pyramids*, add all the breadths at the Baſe gether, and multiply half the length by the Total.

For *Globes*, Multiply the Area of the Circle by 4, gives the Content.

CHAP. XXV.

Menſuration of Solids.

olids, *ſuch as Stone, Timber*, &c. *are Meaſured by the* Cubick *or* Solid *Foot, now a Cube is a Figure like a Dye of 6 Equal ſides, and a Cubick Foot contains* 12 *Inches Square on every ſide.*

T*HE Rule is* Multiply the length by the breadth, and that Product multipl by the depth, which ivide by 1728, the Cubick Inches in a Foot ſolid

Ex-m

Example.

A Piece of Timber 16 foot long, 14 In[illegible] broad, and 9 Inches deep, how many folid [illegible] doth it contain?

```
  12              16
  12              12
 ----            ----
 144             192
  12              14
 ----            ----
1728             768
                192
                ----
                2688
                   9
              ------
1728) 24192 facit 14 f
-----  6912
14    -----
        000
```

Example.

A Stone 7 Foot 3 Inches long, 4 Foot 5 inches
ad, and 2 Foot 3 Inches deep, How many ſolid
ot?

7—3	4—5	2—3
12	12	12
87 length	53	27

87 length
53 breadth

261
435

4611
27 deep

32277
9222

fa. 124497 Cubick Inches.

1728) 124497
3537
facit 72
ſolid feet 81

*To find how many Inches in length make a Foot of
uare Timber*, Multiply the Number of Inches ſquare
it ſelf for Diviſor, and make 1728, the Cubical
ch of a Foot, your Dividend.

Example.

Example.

A Piece of Timber 18 Inches ſquare, what leng[th] will it require to make a Foot ſolid?

```
          18
          18
         ----
         144
         18
      ----------
      324) 1728
      ----------
facit  5 In. 108.
```

Example.

How many Inches in length will make a Foot a[t] 12 Inches Square?

```
         12
         12
      ----------
      144) 1728
      ----   288
facit 12 In.----
              00
```

CHAP.

CHAP. XXVI.

Mensuration of Plank.

A Table shewing how many Foot of Plank of all Natures make a Load or Tun of Timber.

o Foot a Load. 40 Foot a Tun:

th.	Foot.			
Plank	150	make a Load.	3	which divided by, gives the quantity of Feet.
	—— 200		4	
½	—— 240		$4\frac{4}{5}$	
	—— 300		6	
½	—— 400		8	
	—— 600		12	
½	—— 800		16	

Plank	120	make a Tun.	3	which divided by, gives the quantity of Feet.
	—— 160		4	
½	—— 192		$4\frac{4}{5}$	
	—— 240		6	
½	—— 320		8	
	—— 480		12	
¾	—— 640		16	

Example

Example.

In 7685 Foot of 4 Inch Plank, How many Load and Foot of Timber?

15|0) 768|5	3) 35		Load. Foott.
51 18|	11 $\frac{2}{3}$		*facit* 51 11 $\frac{2}{3}$
35 11 $\frac{2}{3}$ Foot.			

the remainder 35, divided by 3, makes Foot 11 $\frac{2}{3}$

Example 2.

In 7685 Foot of 3 Inch Plank, How many Tun and Foot of Timber?

16|0) 768|5		Tun. Foot.
48 128		*facit* 48—01 $\frac{1}{4}$
05	4) 5	
	1 $\frac{1}{4}$	

The remainder of the Divifion is divided by the third Column, as in the Example above, the 7685 Foot is divided by 160, the number of Feet that make a Tun of 3 Inch Plank, and 5 remains, which divided by 4, the Figure even with it gives 1 Foot $\frac{1}{4}$, fo the *Facit* is 48 Tun 1 $\frac{1}{4}$ Foot.

THE END.

Roger Kenyon
His Book
An Dom 1712/13